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Evidence given before the
Standing Committee on Public
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on the subject of whole wheat bread.

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7TH SESSION, 12TH PARLIAMENT, 7-8 GEORGE V, 1917

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THE SENATE OF CANADA

EVIDENCE GIVEN BEFORE THE STANDING COMMITTEE

ON

PUBLIC HEALTH AND INSPECTION OF FOODS

ON THE SUBJECT OF

WHOLE WHEAT BREAD

THE HONOURABLE MR. DE VEBER
CHAIRMAN

PRINTED BY ORDER OF PARLIAMENT.



OTTAWA
J. DE LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1917

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THE SENATE OF CANADA.

STANDING COMMITTEE ON PUBLIC HEALTH AND INSPECTION OF FOODS.

The Honourable Messieurs: De Veber, Chairman; Bourque, Belcourt, Daniel, David, Douglas, Murphy, Sproule and Wilson.

ORDER OF REFERENCE

Pursuant to the Order of the Day, the Senate resumed the adjourned Debate on the Motion of the Honourable Mr. Casgrain:—

That in the opinion of the Senate, during the war, whole wheat bread should be made as soon as possible in Canada.

After debate,

The question of Concurrence being put on the said motion,

The Honourable Mr. Béique moved, in amendment, seconded by the Honourable Mr. Belcourt:—

That the question be referred to the Standing Committee on Public Health and Inspection of Foods.

REPORT

COMMITTEE ROOM No. 69,

WEDNESDAY, AUGUST 1, 1917.

The Standing Committee on Public Health and Inspection of Foods beg leave to make their Third Report, as follows:—

The committee have, in obedience to the Order of Reference of the 12th June, 1917, examined into the question of making Whole Wheat Bread in Canada during the war, heard the following witnesses, namely:—

Dr. A. McGill, Chief Analyst, Department of Inland Revenue; Dr. Stanley Purns, Montreal; Dr. F. T. Shutt, Dominion Chemist, Department of Agriculture; A. E. Labelle, Esq., Manager, St. Lawrence Flour Mills, Limited; A. J. Banks, Esq., Chemist, Ogilvie Flour Mills Company, Limited; Prof. R. Harcourt, Ontario Agricultural College; Paul Schlicht, Esq., Montreal; R. M. Price, Esq., Empire Milling Company; G. W. Shouldis, Esq., Manager, Slinn-Shouldis, Limited, Bakers, etc.; W. H. Dwyer, Esq., Grain Exporter, and now beg to recommend to the Senate:

1. That in the manufacture of flour a larger portion of the wheat berry be included than heretofore.

2. That the public be urged to substitute for wheat flour, whenever possible, flour obtained from rice, barley, maize, oats, rye, beans, etc.

3. That the feeding to cattle of the higher grades of wheat suitable for the manufacture of flour, be prohibited.

4. That a copy of the evidence given before the committee be transmitted to the Food Controller with a strong recommendation that rules and regulations to ensure the successful carrying out of the above recommendations be immediately promulgated.

5. The committee submit herewith the evidence given before the committee and recommend that five hundred copies thereof be printed in pamphlet form for general distributon, and that rule 100 be suspended in so far as it relates to the printing of the said evidence.

All which is respectfully submitted.

L. GEO. DE VEBER,
Chairman.

EVIDENCE.

THE SENATE,

OTTAWA, Friday, July 13, 1917.

The Committee met at 10.30 a.m., Hon. Mr. De Veber in the chair.

The CHAIRMAN: I may say, gentlemen, that owing to the introduction of a motion by Senator Casgrain we have before the committee a very interesting and important subject, on which the committee intends to take evidence.

Dr. ANTHONY MCGILL, Chief Analyst of the Department of Inland Revenue, was called as a witness, and testified as follows:—

Hon. Mr. CASGRAIN: Dr. McGill, would you kindly state what you know about this question. There is no lawyer here to ask questions. Perhaps you have read—

Dr. MCGILL: I have read Senator Casgrain's speech.

Hon. Mr. CASGRAIN: Will you kindly say what is wrong with it?

Dr. MCGILL: In order to get a proper understanding of this question, it appears to me necessary to begin with wheat, the source of the various flours from which bread is made. Wheat is a very variable article, depending upon the variety grown and upon the conditions under which it is grown. The seasonal changes introduce very considerable variations, as well as the character of the soil. I find on examining the records that the water-content of wheat may vary from seven to 14 per cent; that the proteins may vary from eight to seventeen per cent, and carbohydrates from 65 to 76 per cent. I mean the humanly digestible carbohydrates.

Hon. Mr. DANIEL: Have you found that by your own operations?

Dr. MCGILL: No, this is a record obtained chiefly from König's large work, "*Zusammensetzung der Menschlichen Nahrungs und Genussmittel*." König is a German authority who has made a most extensive collection of the work done all over the world on subjects connected with food. This is the authority, and I may say that this is quoted in Bulletin No. 13 of the United States Department of Agriculture.

The fat varies from 0.28 per cent to $2\frac{1}{2}$ per cent; and the ash from 1.40 per cent to 2.30 per cent.

Hon. Mr. CASGRAIN: Would you please tell us what the ash is?

Dr. MCGILL: By the ash we mean the mineral matter that remains after incineration.

I have given you the extremes, both minima and maxima. An average value for wheat, I find, from the consideration of hundreds of samples of wheat whose analyses have been recorded, to be as follows: 11.67 per cent of water; 12.90 per cent proteids; 2.00 per cent fat; 69.95 per cent carbohydrates; 2.04 per cent of what we call crude fibre, that is, organic material undigestible by man; 1.83 per cent ash.

Hon. Mr. CASGRAIN: By carbohydrates you mean the starchy part?

Dr. MCGILL: I call that digestible carbohydrates, yes.

Hon. Mr. CASGRAIN: The starch.

Dr. MCGILL: Yes.

Hon. Mr. CASGRAIN: We want to make it so that people will understand it.

Dr. MCGILL: This particular part of my evidence must be technical, but I shall speak in plain language later on. We determine the nutritive value, the energy-pro-

ducing value of any food, in terms of the calorie. I need not explain what the calorie is; it is simply a unit of measure of energy. An average wheat of the kind whose analyses I have given you represents 358.33 calories of energy.

The various stages of the process of converting wheat into flour will be better described by men who are intimately connected with milling operations. But I may say that in the production of the ordinary white flour, with which we are acquainted, from twenty-seven to twenty-eight per cent of the grain is rejected. It is customary to speak of the ordinary white flour as being produced to the extent of some seventy-one to seventy-three parts from one hundred parts of wheat. This bald statement leads one who does not look more carefully into the matter to imagine that a very large amount of waste is produced in the conversion of wheat into flour. A more careful study of the subject, however, leads one to modify that first impression. In the first place it must be remembered that the value of a food depends not entirely upon the quantity of so-called food material which it contains, but upon the amount of that which the human system can metabolize and assimilate, that is to say, can digest—that is the ordinary term for it—the amount of material that we can digest.

In a report published as Bulletin No. 150 of the Ontario Agricultural College I find that Professor Harecourt has quoted from an American Bulletin No. 101 of the Department of Agriculture at Washington, facts which lead us to modify somewhat the first impression obtained from the simple statement that about twenty-seven per cent of the material of the wheat is rejected in flour production.

Of course, the rejection consists in the careful separation of the exterior part of the grain of the wheat, which forms the bran of commerce.

Hon. Mr. CASGRAIN: About fifteen per cent.

Dr. MCGILL: Also the rejection of the germ, in large part. The germ is practically the oil-containing portion of the wheat grain. By less perfect, less complete rejection of these components of the grain, a larger production of flour is possible. I understand that under British regulations at the present time English millers are required to produce 81 pounds of flour from 100 pounds of wheat; that is to say, nearly ten per cent more than would be produced under the ordinary conditions of fine flour production. I may say that the finest flour is known commercially, I understand, as patent flour or fine flour. Flours from which a smaller proportion of the grain has been removed in production are known as coarse flours or sometimes as entire wheat flours—which, of course, they are not. An entire wheat flour is theoretically practicable, and such a flour is known very largely as Graham flour. Graham flour is supposed to contain a large portion of the wheat grain, which is rejected in the production of the finest grades of flour. I have figures here which enable me to contrast the coarser grades of flour with the fine wheat flour. The mean of a very large number of analyses of fine wheat flour is as follows: water, 12.32 per cent; proteids, 11.09; fat, 1.19; carbohydrates, 80.35; crude fibre, 0.43; ash, 0.54. The calorific value of such a flour would be 385.95 calories.

The mean value of the low-grade flours, including Graham flour, is as follows: water, 12.93 per cent; proteids, 12.77 per cent; fat, 1.88 per cent; carbohydrates, 70.98 per cent; crude fibre 1.56 per cent; ash, 1.68 per cent; and calorific value 367.6

Hon. Mr. DANIEL: What was the calorific value of the first one?

Dr. MCGILL: 385.95, practically 386. We might take these numbers in whole numbers—386 as against 368. It will be seen by comparing these figures that the most marked differences between the fine flour and the lower grade of coarser flours consist in the considerably larger content of proteids in the coarse flour, amounting to a little more than one and a half per cent; the notably larger amount of fat in the coarse flours, amounting to about three-quarters of one per cent—between one-half and three-quarters; the notably larger amount of crude fibre in the low-grade flours, fully one per cent more; and the larger amount of ash, also fully one per cent more. There is a diminution of approximately ten per cent in the carbohydrates in the coarser flours; that is to say, taking the total weight of the flour, there is ten per cent less

of starchy matter in the coarser flour than in the high-grade flour. Of course, these differences are perfectly intelligible when we remember that the rejected portion of the wheat grain in the preparation of fine flour, namely, the bran and the germ, contain most of the mineral matter and most of the fat, thus accounting for the increase in ash and the increase in fat in the coarser grades of flour. Against this we must remember that in the case of fine flour we have a less total quantity; one hundred parts of wheat produce, we will say, in round numbers, 70—strictly speaking, it is from 70 to 73 pounds of fine flour; but from that same 100 pounds of wheat you can get 80 pounds, or somewhat more, of the coarser flour.

Looking upon the two products in relation to the value of the wheat which produced them, it does not follow that the lessened percentage of carbohydrates in the flour itself represent a lessened percentage of carbohydrates as compared with the wheat from which it was produced. In fact, on the assumption that the ratio of production from a given amount of wheat is as seventy to eighty, which is not strictly correct, but approximate, the values from 100 parts are increased about 14 per cent; in other words, from 100 parts of wheat we get practically 14 per cent more of the various components that constitute flour. I have said that from 100 parts of wheat fine flour contains 11.09 of proteids. From 100 parts of wheat coarse flour, calculated on the amount of wheat from which it was produced, would contain 14.59 per cent of proteids.

Hon. Mr. DANIEL: Would you explain what you mean by proteids, as you go along?

Dr. MCGILL: Well, protein is analogous to—it is the nitrogenous component of flour; it is that component of flour that makes it valuable in building up the framework of the body.

Hon. Mr. CASGRAIN: Hear, hear.

Dr. MCGILL: May I digress a moment in answer to your question? Food may be regarded as essentially required by us first to build up the framework of the body; secondly, to supply energy to make that body act. The framework of the body is made up of material of proteid character, and we must have proteids in our food. Typical proteids are albumen, in the white of egg; musculin, the lean of meat; and the gluten of flour and similar materials. The casein of milk, for instance. These are typical proteids, which go to furnish the framework of the body, and it is absolutely necessary that our food should contain proteids, and should contain them in a certain ratio to the total weight of the body and to the amount of work which the body is expected to do. There are two other classes of food, fat and carbohydrates, as we call them, which do not contain nitrogen, which do not contain proteid substances, which do not go to build up the framework of the body, but, on digestion, furnish power to do work—energy. These, of course, must be furnished with our food also, and they must be furnished in proportion to the amount of work which the body is expected to do. A man of from 150 to 160 pounds in weight—I may say that the figures that I now give you are quoted on the authority of two German investigators, Voit and Rubner, the greatest living authorities on this particular phase of the question.

Hon. Mr. CASGRAIN: Do they not incline towards calories as against the other substances?

Dr. MCGILL: I would like to state first the energy value in calories; that is much the simpler way of doing it. A man of the weight that I mention, about 150 to 160 pounds, requires 1,680 calories of energy to keep him alive, on the supposition that he lies in bed for the whole twenty-four hours, and does not move at all. He requires that much energy to keep him alive, to keep his heart beating, his blood circulating and maintain the life processes. If he does any work, no matter how little—if he sits in a chair for ten hours, his body has to occupy an upright position, and that requires more energy; he then must have 2,170 calories. If he is going

to do any hard work, like farming, he must have 3,500 calories of energy supplied him within twenty-four hours. Now this energy that I speak of is derived from his food, and his food consists of proteid matter, fat matter and carbohydrate matter, and these must bear a certain ratio to each other. For a man of average weight, one hundred and fifty to one hundred and sixty pounds, in order that he may do an ordinary day's work—nothing extraordinary—he must have 4.2 ounces of proteids, at least 2 ounces of fat and at least 18 ounces of carbohydrates. That is a minimum ration. That is the least he should have if he does any work at all and is not to draw upon his body weight, to decrease in weight.

Coming back to the question of bread, we shall see that bread supplies proteids, fat and carbohydrates, but the amount of fat supplied even by the best flour, by the whole wheat flour, is very low and must be augmented from some source. Bread furnishes a very considerable, a far from negligible amount of proteid matter, but the great value of bread, the main characteristic value of bread, is in the supply of carbohydrates, that is to say, energy-producing material; not body-building material, although it provides that too. The ratios of proteid to carbohydrates in the minimum ration which I have quoted from Voit is 4.2 to 18; that is to say, it is about one to four, or one to four and a half. Even the bread richest in proteids does not supply proteids in that ratio to its carbohydrates content; consequently bread must be looked upon as essentially an energy-producing food, although at the same time it does furnish very valuable body-building material, and in considerable amount—as I say, far from negligible.

I am afraid that I am digressing a little. What you want to know, as I understand, is whether it is advisable under present conditions to forbid the manufacture of white flour and to insist upon wheat being milled and supplied to the public as whole wheat flour or something approaching that. Instead of securing something like 70 per cent of the total of the wheat as flour, would not it be better for us to insist upon the production of 80 per cent or more of flour from every 100 parts of wheat? In this connection I can do no better than read the report of the Rothamsted Institution in England, under the direction of Laws and Gilbert, who are recognized authorities on this matter, which is contained in Mr. Harcourt's report. This is what Gilbert says:—

The higher percentage of nitrogen in bran than in fine flour has frequently led to the recommendation of the coarser bread as more nutritious than the finer. It is, however, we think, very questionable whether upon such data alone a valid opinion can be formed of the comparative values as food of bread made from the finer or coarser flours from the same grade of wheat. It is an indisputable fact that branny particles when admitted into the flour in the degree of imperfect division in which our ordinary milling processes leave them—

I may say that milling processes have been greatly improved since this was written in 1881—very considerably increases the peristaltic action and hence the alimentary canal is cleared much more rapidly of its contents. In other words, the coarse flour and coarser bread have an aperient action. It is freely granted that much useful nutritious matter is in the first instance lost as human food in the abandonment of 15 to 20 per cent of the wheat grain to the lower animals. It should be remembered, however, that the amount of food so supplied is by no means entirely wasted. All experience tends to show that the state as well as the chemical composition of our food must be considered. If whole grain were finely ground, it is by no means certain that the percentage of real nutritive nitrogenous matter would be higher than in ordinary bread flour.

It is evident, therefore, that there are two sides to this question. A further illustration of this found:—

The protein, fats, and carbohydrates of different kinds of bread have been found to be digested by the human stomach in very different degrees. The protein of white bread is digested to the extent of 85·8 per cent; in Graham bread to the extent of only 77·6 per cent; with fat there is very little difference. As regards carbohydrates, 97·5 per cent of the carbohydrates of white bread have been found to be digestible, whereas only 88—or about 9 per cent less—of the carbohydrates of Graham bread have been found to be digestible. One objection which is often made to the production of a high percentage flour from whole wheat is that the fatty matter of the germ makes it more difficult to keep such flour.

Hon. Mr. CASGRAIN: But it is fatty outside of the germ, too. Is not the endosperm a fatty substance too?

Dr. MCGILL: Oh, yes, but the fat is essentially in the germ. That aspect of the question is one that I cannot speak about from personal experience. I have no doubt that there are practical millers here who would be able to settle that point.

I have in my hand a report dated 1911, from the Local Government Board in England, by Dr. Hamill. His conclusions with regard to the difference between the values of white flour, fine flour and Graham flour are, it appears to me, of great weight:—

There is no doubt that some people who are accustomed to a mixed diet find as a result of sufficient trial that bread of one particular class suits them individually better than another. Suitability in this sense may be the result of the greater or less time required for mastication, the presence or absence of laxative properties, the advantage or the reverse of including in diet an article which leaves a larger undigested residue.

Hon. Mr. CASGRAIN: Where does it go?

Dr. MCGILL: It passes out with the feces.

Hon. Mr. CASGRAIN: It has alimentary value but no nutritive value.

Dr. MCGILL: Quite so.

The nature of the other ordinary constituents of the dietary differs in flavour or other factors. It is asserted that whole meal bread is not so liable to a reproduction of caries of the teeth,——

That is decay of the teeth.

——as a result of fermentive changes, as is bread made from a high grade flour.

The evidence on this point, however, cannot be considered conclusive. I shall be glad to answer any questions which any of the members of the Committee may ask.

Hon. Mr. CASGRAIN: You said that you read the speech of Senator Casgrain. What is wrong with it according to you?

Dr. MCGILL: I would say that on the whole it rings true, with a somewhat too great emphasis—I might almost say exaggeration—of certain aspects of the question, so far as I may judge those aspects from my own knowledge.

Hon. Mr. CASGRAIN: Is it not necessary to have with nutritive food that you digest a certain proportion of alimentary food in order to have evacuation?

Dr. MCGILL: It is absolutely necessary that we should have a certain bulk as well as nutritive value.

Hon. Mr. DANIEL: How does the food value of oatmeal compare with the food value of wheat flour?

Hon. Mr. CASGRAIN: There are more calories in oatmeal.

Dr. MCGILL: I have here a tabulation of those values.

Hon. Mr. CASGRAIN: Could you put that in your evidence?

Dr. MCGILL: I could leave the whole thing.

Hon. Mr. DANIEL: You might tell me the difference in the food value of oatmeal, and perhaps the Chairman would include the whole list of statistics with regard to the comparative food values in the report, which I think would be very valuable.

Dr. MCGILL: I may say that this paper which I hold in my hand is to be published as a bulletin of the Inland Revenue Department. The value given by Konig in the great work which I have already quoted from, is as follows: This is a recalculation by myself, so I will have to explain it. One pound of fine wheat flour contains 1.709 ounces of protein, 0.180 ounces of fat, 11.950 ounces of carbohydrates; coarse wheat flour 1.856 ounces of protein, 0.254 ounces of fat, 11.742 ounces of digestible carbohydrates; oatmeal: one pound of oatmeal contains 2.219 ounces of protein.

Hon. Mr. CASGRAIN: Twice as much.

Dr. MCGILL: 0.989 ounces of fat, 10.730 ounces of carbohydrates. Oatmeal is therefore a much richer food.

Hon. Mr. DANIEL: And a much more valuable food than wheat flour.

Dr. MCGILL: Yes.

Hon. Mr. DANIEL: You made one other statement that the digestibility of the carbohydrate in Graham flour was less than in white flour.

Dr. MCGILL: Yes.

Hon. Mr. DANIEL: How do you account for that? The carbohydrates are the same, are they not?

Dr. MCGILL: I am quoting from the work reported in Bulletin 101 of the Department of Agriculture of the United States. This represents the result of actual digestion experiment on man.

Hon. Mr. CASGRAIN: Why should they digest in one case and not in another?

Dr. MCGILL: These are empirical numbers. I do not know why.

The CHAIRMAN: I understand that it takes 150 pounds of wheat to make one hundred pounds of flour.

Dr. MCGILL: Of fine flour, about that, yes.

The CHAIRMAN: There is a difference in value between the coarse flour and the fine flour of 10 per cent, according to your figures. You get 10 per cent more of coarse flour than you do of fine flour.

Dr. MCGILL: At least that amount.

The CHAIRMAN: There is a gain of 10 per cent. Then you get a considerable percentage of gain in the protein or gluten, the flesh building part of the flour.

Dr. MCGILL: Yes.

The CHAIRMAN: So you get a gain there. You have said nothing about the ferments of the flour. To a certain extent wheat contains ferments which in some degree digest it. Would there be a greater amount of ferment in the coarse flour than in the fine flour?

Dr. MCGILL: That is a subject on which I am not prepared to speak. There is no doubt that wheat contains diastase, which will change starchy food matter into dextrine. These are not changed in the milling process. If you want to make a malt out of wheat, you have to proceed quite otherwise than you would in milling.

The CHAIRMAN: The medical profession have found that the condensing of food has to a very large extent increased constipation, and if fine wheat flour was used altogether something else would have to be used to keep the bowels in a proper condition.

Dr. MCGILL: Under ordinary conditions we do that. We use vegetables and fruit.

Hon. Mr. DANIEL: Man does not live by bread alone.

The CHAIRMAN: But if you were restricted to a straight bread diet, you would live longer and easier on coarse wheat flour than on fine wheat flour?

Dr. MCGILL: Undoubtedly. If the matter before us now were a question based upon the assumption that bread was to constitute the whole or the larger part of our diet, it would change the character of the subject very considerably.

Hon. Mr. CASGRAIN: You said early in your remarks that this perfectly white and pure patent flour does not go sour, but that the coarse flour does go sour.

Dr. MCGILL: No, I did not say that. I understand that, but I said that there were millers who were far more conversant with the matter.

Hon. Mr. CASGRAIN: As a chemist you know that there cannot be fermentation without ferments.

Dr. MCGILL: Yes, but—

Hon. Mr. CASGRAIN: If there cannot be any fermentation without ferments, after the ferments are taken out of patent flour it will not ferment.

Dr. MCGILL: Quite so.

Hon. Mr. CASGRAIN: But the coarse flour will ferment and turn sour.

Dr. MCGILL: If the ferments are there it will be very difficult to prevent fermentation. The ferments that we are interested in in digestion are the euzymes. The proteids are digested by the digestive juices.

The CHAIRMAN: At the same time we gain a lot of things by having coarse flour, although it does not keep as well.

Dr. MCGILL: It may not. I do not give positive evidence on that point.

Hon. Mr. DANIEL: I would like to ask whether Dr. McGill has any information to give on the difference in cost of value of whole wheat and patent flours. Probably it may come better from some one else, but if Dr. McGill has an opinion on this I would like to hear it.

Dr. MCGILL: I have no opinion, but I have thought of the matter. An argument for the production of a coarse flour as against the production of a fine flour might be based, under present war conditions, upon the fact that it would liberate labour, which is now employed in the production of fine flour, since it is natural to suppose that the production of fine flour would involve more labour than the production of coarse flour. I am not a miller, as I have said, and cannot answer that point definitely.

The CHAIRMAN: Have you concluded your evidence, Doctor?

Dr. MCGILL: Of course, the subject is so vast that perhaps some one may like to ask a question.

Hon. Mr. RICHARDSON: You confine your remarks to Graham flour. That I presume is whole wheat flour. Did you take into consideration 76 per cent or 80 per cent flour?

Dr. MCGILL: In quoting figures for other grade of flours known as coarse grade flours, I have included that class of flour along with Graham flour.

Dr. STANLEY BURNS, of Montreal was called as a witness, and testified as follows:—

Hon. Mr. CASGRAIN: You have heard the evidence of Dr. McGill as to the effect upon the teeth, and that is why you are here—to speak on the question of the teeth.

Dr. BURNS: The teeth and gums. For about twenty-five years I carried on research with regard to conditions of disease in the mouth and teeth, and while I was rather a pioneer in that line, yet, after ten years time, I got some little inkling as to what might be the cause, and I found that the conditions of decalcification of the teeth were

largely due to the condition of assimilation of food and to the food itself. I took several young people between the ages of nine and eleven and put them on a whole wheat diet. That wheat was the whole wheat, not ground at all, but boiled from morning until evening, until the envelope of the wheat was burst. And they were fed on that morning and evening. The mid-day meal does not count for so much as regards the action of the food on the system, because that is very largely consumed by the energy of the person. It is more important to control the food that is in the stomach during the time of sleep, when the stomach acts as a retort and the chemical action is pronounced, eventually acting on the tissues of the teeth and gums.

Hon. Mr. DANIEL: Are you a dentist?

Dr. BURNS: I am a pyorrhea specialist; that is, I specialize altogether in diseases of the gums and teeth.

I found in the young folks, where the teeth were decalcified, that by acting with this whole wheat flour for one month's time I changed the condition of their teeth. I could not reconstruct, but I stopped the progress of decalcification. Decalcification is not decay from without. The decay in a tooth from without is largely from lactic acid; the decalcification is produced by the lack of the mineral properties, which are bone-producing properties. When these are not sufficient, the stratified development of the tooth is broken down and underneath the enamel the tooth structure becomes much the same as if a marble slab were struck with a hammer.

So I found that the whole wheat—not flour, but the whole wheat itself, produced this result. But you can understand it would be very hard to have a household carry out that treatment; so I found also that in the treatment of diseases of the gums, in the sloughing pyorrhea and trench mouth, in regard to which I am at present consulting specialist for the Canadian Army Dental Corps, in difficult cases of that kind, not the simple cases, I found that these conditions were largely due to the impaired assimilation of food. And, as I said, you could not keep these patients on this whole wheat diet, because of the trouble it is to prepare it. There was only one other way to offset the mucilaginous nature of the food, produced by the present wheat flour, as I take it, and that was to increase the ferment, which would break up the bolus in the stomach, and in turn producing a true secretion to the glands of the mouth. The diseases in the mouth are largely because the mouth has lost its protection and the gums slough, and the gums suppurate because of the sloughing. The secretions in the mouth are to protect the body in two ways. The primary step in the assimilation of food is the mastication and mixing of the food with the ptyaline of the saliva, and when these secretions are not true, you can understand it is almost a continuous process, in which the bolus is passed down in an impaired condition chemically; hence the true secretions do not come back to the mouth and the second condition is worse than the first. By increasing the fermentation you can bring about a balanced diet, and that balanced diet brings a balanced constitution. The secretions in the mouth, as I have found out, are also for the purpose (in a primitive man they would be; of course) of protecting the body, just the same as animals intuitively cure any injury to their body. When young children are injured, if they hurt a finger, their first thought is to put it into the mouth. Without any teaching, or anything else, this is done.

Hon. Mr. DANIEL: They put everything else into their mouth, too.

Dr. BURNS: And this would cure an injury if the secretions were true, because, as regards the curing of the gums in disease, you can cure the diseases purely by acting on the stomach, by bringing the true secretions there, and not by local conditions at all.

Hon. Mr. CASGRAIN: Your contention is that coarse flour is the right thing?

Dr. BURNS: I have proven it.

Hon. Mr. DANIEL: Not coarse flour, but the whole wheat grain boiled until it bursts.

Hon. Mr. CASGRAIN: And next to that, when the whole wheat cannot be got, the coarse flour.

Hon. Mr. DANIEL: No, he did not say anything about that.

Dr. BURNS: I have proven that about coarse flour, using the old Aberdeen stone flour, and I found good results with it. At present, in my own family, when we cannot get that now, we take the wheat to a hasher and have it ground fine, and, while it is hard to make a bread, because it does not rise as well as the other, yet, after all, by using that as porridge, and also what are called gems (bread), you can get a better condition than from roller process flour.

My boy, who is now overseas, had been at home all the time, but after being away from home about six months and eating the food such as you get in barracks, had four cavities develop in his teeth during that time, although previously he never had a decayed tooth in his head.

Hon. Mr. DANIEL: What kind of flour do they use in the army?

Dr. BURNS: It was in Canada here.

Hon. Mr. DANIEL: Not overseas?

Dr. BURNS: No; the flour used overseas is, I understand, different from what is used here; they are obliged to give a coarser flour in England than they are here. I was speaking only of Canada, of the barracks here. Now, I cannot give any data, any figures for that; I am only making a reference to this mouth, which was absolutely perfect and watched, and yet in this case the cavities formed there, and they were not lactic acid cavities.

Hon. Mr. DANIEL: Was there any retreating of the gums?

Dr. BURNS: No, sir none at all. You see in young children, there would not be any recession of the gums, except in the case of a very anæmic child who had been under disease a great deal.

Hon. Mr. DANIEL: Yes, but this is a young man, with permanent teeth.

Dr. BURNS: He was twenty years of age. I have brought that up only to show the condition where for the last fifteen years we have watched the diet very closely in our own home, and after he had left home this result came. That might not be due to the flour, but at home he had always used the coarser flour.

Hon. Mr. BOURQUE: You said a while ago that the wheat was boiled and was used at the evening meal. In what way would you advise that it be prepared, so that any who took a fancy to that might know how to use it?

Dr. BURNS: Well, there is one thing I found, in my own children especially, and this is how I have used it. The wheat is cooked all day, and at the end of that time the envelope of the wheat bursts. Then it is ready for consumption and we found that it was very sweet, that very little sugar was required to be used with it. One advantage of that wheat when it went into the stomach was that it agitates the stomach, it induces the gastric juice to come in greater quantity and prepare that food for assimilation. With the fine flour I have found, just from my own quiet research, that there is a tendency for those fluids not to come in relative proportion, to produce thorough assimilation.

Hon. Mr. BOURQUE: If I understand you rightly, the children would eat this in the form of porridge?

Dr. BURNS: Yes, porridge altogether; nothing in the nature of bread. For bread I had them roast the white bread, not toast it, so as to get rid of the starch and put them on the straight diet for bone producing. With the toast or the plain bread, we found we could not get the results.

Hon. Mr. DANIEL: Did you ever try oatmeal porridge?

Dr. BURNS: Well, yes, I was brought up on it myself.

Hon. Mr. DANIEL: Your teeth are all right.

Dr. BURNS: Well, I guess I have a good deal to thank oatmeal for, as to that. But the rolled oats, I think, do not produce the same result, because in the one all the true properties are kept within the kernel of the wheat, and in the other they are allowed to evaporate.

As regards glandular swelling. I have found conditions of glandular swelling that has been changed by increasing these ferments; not by change in diet at all, but increasing the ferments, where you have a better assimilation of food. Now, I believe that the true wheat would produce that result, only it is difficult to get anything carried out properly in that respect as regards diet.

Hon. Mr. BOURQUE: You have read Senator Casgrain's speech on this question?

Dr. BURNS: Yes, I have read it.

Hon. Mr. BOURQUE: In your opinion, is it about correct that the coarse bread is generally the best for any family?

Dr. BURNS: Yes, according to all my experience, the speech given by Senator Casgrain covers the ground thoroughly. I am not able to speak of more than just the action of the food on the mouth, and glandular conditions, and the calcification of the teeth.

Hon. Mr. CASGRAIN: The purport of your evidence then, Doctor, I take it, is that coarse wheat bread is better for the teeth?

Dr. BURNS: Yes.

Hon. Mr. CASGRAIN: That coarse flour is better for the teeth?

Dr. BURNS: Yes, and that is why I have used it in my own family.

Hon. Mr. CASGRAIN: You have cured people, you say, with that diet?

Dr. BURNS: Yes, I have.

Hon. Mr. DANIEL: You would not say it is better than oatmeal?

Dr. BURNS: No, I would not; because both grains are in their true envelopes and produce the mineral salts, and mineral salts are the natural antiseptic bodies; you get them from oatmeal as well as from wheat.

Dr. F. T. SHUTT, Dominion Chemist, of the Department of Agriculture, was called as a witness, and testified as follows:—

Dr. SHUTT: Mr. Chairman, in the letter that I received the day before yesterday from the Secretary of this Committee, asking me to be present this morning, reference was made to a speech by the Honourable Senator Casgrain on whole wheat bread, and that letters was accompanied with a copy of that speech. I inferred from the tenor of the letter that I should be expected to give my opinion on the statements made in the speech. That was the principal object, I presume, in asking me to be present to-day. However, I should like to say at the outset that I think no useful purpose would be served if I were to comment on or criticise this speech clause by clause but as silence might be taken for consent, I should like to point out one or two matters which appear to be of a fundamental character respecting it. The first is, that, while I am quite sure that the intentions of the honourable senator are those which are quite commendable, at the present time especially, nevertheless, I am of opinion that he does not mean what he says. The motion is:—

That in the opinion of the Senate, during the war, whole wheat bread should be made as soon as possible in Canada.

Hon. Mr. CASGRAIN: That means eighty-five per cent at the most.

Dr. SHUTT: That is what it very probably means, but it does not say so.

Hon. Mr. CASGRAIN: It is clear enough for everybody who understands anything about the question. Assume that it is eighty-five per cent.

Dr. SHUTT: Very good, but it is necessary to point out and clearly state that fact. I presume that in the opinion of ninety-five out of one hundred, that when you say

whole wheat bread, it means that it was made from flour produced from the entire wheat.

Hon. Mr. CASGRAIN: Not including the bran. Fifteen per cent goes out for bran.

Dr. SHUTT: I know, but that is not whole wheat bread; because there is such a thing as whole wheat bread.

Hon. Mr. CASGRAIN: Let us leave the question of whole wheat and start from eighty-five per cent.

Dr. SHUTT: There is a whole wheat bread; Graham flour is the flour from grinding down of the whole wheat berry, and that would be properly called whole wheat. Now, throughout this whole address, in which, as I have said, the intentions of the honourable gentleman are excellent, there is no mention of eighty-five per cent whatever. This address as indeed the honourable gentleman stated in it, is based upon a bulletin issued under the auspices of the Quebec Government. It is entitled "La Grande Erreur du Pain Blanc". I say that because the honourable senator refers to that fact himself, and then in looking through the speech, I see it is practically a paraphrase of this bulletin. Therefore, what the bulletin teaches we find in this address, I am saying this only because you expect me—

Hon. Mr. CASGRAIN: That is what you are here for.

Dr. SHUTT: Now, you will clearly understand me when I say I think this is an extremely important matter.

Hon. Mr. CASGRAIN: Here (referring to copy of speech) is the reference to eighty per cent; but never mind, let us go ahead.

Dr. SHUTT: No, no, I must correct you there. The reference is "Then there is the endosperm, which contains 80 per cent of the starch and gluten." There would be a very wrong inference if I were to permit this to go without challenging it. That statement does not say anything whatever to the effect that "eighty per cent" refers to this bread that is spoken of. It refers to the endosperm, a distinct part of the wheat berry. Now, I saw that with the intent, and the underlying principle which has caused the production of this bulletin, I am very largely in accord, but too many of the statements that are contained therein I could by no means give my support, because I have seldom seen—I shall speak mildly, but still emphatically—I have seldom seen between two covers so many inaccuracies, extravagances, exaggerations and false statements. I could go through and point them out. There are plenty of them. The bulletin is unreliable and misleading.

Hon. Mr. CASGRAIN: That is what you are here for. Point them all out.

Dr. SHUTT: We find here the statement that the white flour is loaded up with salicylic acid, boric acid, gypsum, and a number of other materials. Well, such is not the case. There is not a flour on the market.

Hon. Mr. CASGRAIN: Would you be able to say that to your knowledge nothing of the kind has ever been done to the flour?

Dr. SHUTT: I say such a thing is not done at the present time.

Hon. Mr. CASGRAIN: Not done anywhere? Can you say that on oath?

Dr. SHUTT: Well, I am not on oath at the present time; but without hesitation I say that there is no such thing on the Canadian market as flour containing gypsum, salicylic acid, or any of the minerals mentioned here (in the speech). I say that without hesitation, without any fear of contradiction. Then we have arguments here in support of which the Scripture is quoted. I shall not follow the example, nevertheless these things must be looked into. The statement is made that it was the intention that bread from the whole wheat should be consumed by man. Now, I do not know what justification there is for making a statement of that character. One might as well say that because the banana is a good thing, we must eat the skin, or because walnuts are good, we must eat the shells, or because potatoes are good, we should eat the peel. We might say that on just exactly the same ground.

Hon. Mr. CASGRAIN: Some people are obliged to eat potato peelings now.

Dr. SHUTT: I have not heard of it. I do not think it would serve any useful purpose to consider the speech of the honourable gentleman clause by clause. I agree to a large degree with the principles that have given rise to it, but I shall be possibly able better to further this cause, if he has one—

Hon. Mr. CASGRAIN: I have no cause.

Dr. SHUTT:—by not taking up any further time of this committee with it, unless there is some particular point in connection with it that you would like to have my opinion upon. I wish merely to make the statement that there is such a thing as whole wheat flour, but the "whole wheat" bread is not eaten in the old country; it is not used by the King and Royal Family on the King's own table, and further that the production of whole wheat flour or Graham flour, for general universal consumption is not feasible, nor desirable, nor practicable.

Hon. Mr. CASGRAIN: What percentage would you allow?

Dr. SHUTT: I am just going to treat of that, and I may now pass on to my proposal in connection with that matter, unless there are further questions the Committee would like to ask, I think that under the present war conditions, with what we have ahead of us in connection with the desirability, the necessity for the strictest economy of food material, it would be very desirable for the Government to enact a law and make regulations which would increase the percentage of the extraction of our wheat. At the present time we extract from 70 to 72 per cent, and I think it is quite feasible to produce a flour which would furnish a nutritive and wholesome bread if the percentage of extraction were raised to 80 per cent. That has been done in England. I have before me the regulation respecting the manufacture of flour dated the 24th February, 1917, which gives in the schedule the percentage of flour which must be obtained from different grades of wheat. The percentage of meals produced from oats, rye, rice, and barley to be added are also regulated.

(Regulations Appendix "A".)

Hon. Mr. WATSON: What is your opinion about the keeping qualities of flour if the extraction is 70 per cent and if it is 80 per cent.

Dr. SHUTT: I do not think that a flour of 80 per cent extraction would have the same keeping qualities as a flour of 70 per cent extraction.

Hon. Mr. WATSON: If you brought it down to 60 per cent, which would keep the better?

Dr. SHUTT: I have had no experience with a 60 per cent flour. One would naturally expect that it would keep as well, possibly better. I do not know that the difference would be appreciable, but certainly the 70 per cent flour would have a higher nutritive value.

Hon. Mr. WATSON: For what reason?

Dr. SHUTT: The fat would be higher in the 70 per cent than in the 60 per cent and there would be a larger percentage of protein in the flour of the higher extraction, it would be more nutritive. However, the 70 per cent to 72 per cent flour has excellent keeping qualities, and I am sure there would be no object at the present time in considering a flour of less than 70 per cent extraction.

By such means as I suggest the amount of flour for human consumption would be very materially increased—about one-seventh. We should have eight barrels produced where we now have only seven. By raising the extraction to 80 per cent we could increase the output of flour by about one-seventh.

Hon. Mr. WATSON: Would there be much difference in the case of 80 per cent and 90 per cent flour?

Dr. SHUTT: Yes, I do not know that under any circumstances I would recommend a 90 per cent extraction, because I think it would be most disadvantageous to all concerned to have more than 80 per cent of the wheat in ordinary flour. The bran ele-

ments are not amenable to the human digestion, therefore they must be eliminated. Certain of the bran elements would be present in a 90 per cent flour and that would be most undesirable.

Hon. Mr. WATSON: I was speaking more with reference to the storage qualities. The germ would have more effect than the bran.

Dr. SHUTT: Undoubtedly, if that matter was specifically under consideration, I think that we should have to consider very carefully the question of flour for export purposes. I think it might be necessary to make a special recommendation affecting the per cent of extraction from wheat for export purposes. We might have to retain probably 70 to 75 per cent for export purposes, but for home consumption we could use the 80 per cent extraction.

Hon. Mr. RICHARDSON: At the present time the export flour for war orders is 76 per cent?

Dr. SHUTT: Are you speaking with regard to the British War Office or the Canadian War Office?

Hon. Mr. RICHARDSON: It is going abroad.

Dr. SHUTT: Much of the flour going abroad is examined by us; we have analysed several hundred samples in the last few years, but I do not think there is any ground for asserting without any possibility of denial that the whole of the flour exported from this country is 76 per cent or over. I could not say so. I know that 76 per cent has been manufactured and probably exported, but I also know that mixed flours have been taken, too.

Hon. Mr. WATSON: That would be governed by the grade of the wheat.

Dr. SHUTT: That is quite true. If 80 per cent extraction were allowed from No. 1 hard or No. 1 Northern the percentage would have to be arranged to the grade of the wheat; it would be lower from grades lower than No. 1.

The CHAIRMAN: Mr. Watson, this bread is made from the flour which is now being exported to the British Government.

Hon. Mr. WATSON: That is all right, but 76 per cent of a No. 1 Northern wheat and 76 per cent of the ordinary straight grades would be different.

Dr. SHUTT: Yes.

Hon. Mr. CASGRAIN: Did you ever analyse any 76 per cent flour?

Dr. SHUTT: Yes, we have.

Hon. Mr. CASGRAIN: When?

Dr. SHUTT: Oh, within the last three months. We have a large number of flours going constantly through our hands—not making a complete analysis, but the samples are being examined by us as to moisture content, every day of the week.

Hon. Mr. CASGRAIN: And what has been the average for export lately?

Dr. SHUTT: I am afraid that I am really not at liberty to make some things known with regard to this matter. I do not think it really touches the question at issue, and without special permission I do not feel that I could discuss the results that I have obtained in connection with the work to which reference is now being made. I am only too glad to give any information that bears on the question under discussion. I have made the statement that I consider that bread made by the 80 per cent extraction from the No. 1 grade would be perfectly wholesome and nutritious, but at the same time, I may add that it is not as digestible as the 71 per cent flour. It however contains more protein.

Hon. Mr. CASGRAIN: Would it not be more of a laxative nature than the other?

Dr. SHUTT: Yes, decidedly, and therefore for persons who need a mild laxative undoubtedly it would be most useful.

Hon. Mr. CASGRAIN: Do you know what proportion they use in Belgium in making bread?

Dr. SHUTT: At the present time—No.

Hon. Mr. CASGRAIN: Can you say with regard to France?

Dr. SHUTT: I could not, I should not like to quote from memory.

One point now with regard to the digestibility of the breads made from 70 per cent to 80 per cent flour, respectively. I have before me a report made by a special committee appointed by the Royal Society of England at the instance of the Board of Trade, the whole brochure being on the food supply of the United Kingdom.

Hon. Mr. DANIEL: What is the date of that?

Dr. SHUTT: 1917. In speaking of the possibility of a better recovery of flour in milling it says:—

Under present conditions, millers obtain on the average about 70 per cent of flour from cleaned wheat, the 30 per cent of offals being sold for feeding stock. Many mills could readily be adjusted so as to recover 80 per cent of the wheat in the form of flour, and "80 per cent" flour has been shown to make wholesome and palatable bread. Such bread, however, is considerably less digestible than bread made from "70 per cent" flour. From the results of American digestibility experiments, and from experiments carried on at Cambridge, it may be concluded that on the average the relative digestibilities for protein and energy values of these two kinds of bread are as follows: Bread made from "70 per cent" flour, percentage of digestibles, protein 89 per cent, calories 92 parts in every hundred. Bread made "80 per cent" flour, percentage of digestibilities, protein 81; calories, 87.

On the other hand, "80 per cent" flour contains more protein than "70 per cent" flour. If "70 per cent" flour contains 11.5 per cent protein, "80 per cent" flour will contain not less than 12 per cent.

The report goes on to say:—

On these data it is possible to calculate the gross gain in protein and calories available for human food which would result from the general adoption by millers of an "80 per cent" standard.

The gross gain in protein and calories in changing from 70 per cent to 80 per cent extraction are calculated. On a milling standard of 80 per cent the annual production of flour in Great Britain would be 4,775,000 tons; on the 70 per cent basis the production would be 4,178,000 tons. That is to say, there would be a gain in total production, brought about by the change from the 70 per cent to the 80 per cent standard, of 597,000 tons of flour.

Hon. Mr. CASGRAIN: That would be one-eighth.

Dr. SHUTT: Yes, or nearer one-seventh.

Hon. Mr. WATSON: Does the report state what would be the value in food products?

Dr. SHUTT: Yes, I will read it.

The total protein in the flour produced by 80 per cent extraction is 573,000 tons, and the total protein in the flour produced by 70 per cent milling is 480,000 tons, which shows a gain in protein of 93,000 tons. But we must examine further and see whether that 93,000 tons is as digestible as was the smaller amount. When you come to the digestibility of protein you find in the 80 per cent flour 464,000 tons protein and in the 70 per cent flour 427,000 tons, a difference of 37,000 tons, so less than half of the additional total amount of protein gained in raising the extraction from 70 per cent to 80 per cent is digestible. Notwithstanding the fact that this protein is less digestible, there is a net gain, but it is not a gain which at all approximates the total amount. Now, the

total calories in 80 per cent flour are 17,376,000, and in the 70 per cent flour 15,203,000, which means that there is a gain by reason of the increased extraction of 10 per cent of 2,173,000 calories. Of digestible calories (calories of the digestible part of the flour) there are 15,117,000 in the 80 per cent flour, and 13,987,000 in the 70 per cent flour, a gain of 1,130,000 calories, so that only half the calorific value of the gain is obtainable or recoverable from the fact that this bread from 80 per cent flour is less digestible than bread from 70 per cent flour. In a word, the gains of total protein and calories are large, but when corrected for digestibility considerably less than half the total gain of protein and about half the total gain of calories are available for the actual nutrition of the human body.

Hon. Mr. DANIEL: When were these experiments made?

Dr. SHUTT: They extended over a considerable time in England and the United States, but the work is comparatively recent. The calculation have been made this year.

Hon. Mr. WATSON: Does that report deal with the value of the difference between 70 per cent and 80 per cent?

Dr. SHUTT: It does.

A further correction is necessary for the decrease in production of pig meat (pork and beans) due to the removal of wheat offals from the market.

It is obvious that if you put 10 per cent more in flour you have 10 per cent less to feed the pigs. This has been worked out as to the losses of pig meat which would necessarily follow by reason of taking this 10 per cent out of the offals sold. There are 597,000 tons of offals which would have been sold as offals but which on the 80 per cent basis would find a place in the flour. That is said to be equivalent to a live weight of pigs, of 80,000 tons; that is to say, this 597,000 tons of offals would produce 80,000 tons live-weight of swine, which would be equal to 64,000 tons of meat which would contain 6,000 tons of protein and have a calorific value of 264,000. The report further says:—

Subtracting these figures for protein and calories, the net gain for human consumption which might result from raising the millings standard from 70 per cent to 80 per cent appears to be: protein, 31,000 metric tons; calories, 866,000; or “man” per day for a population of 36,000,000 “men,” 2.36 grammes protein, and 66 calories.

Hon. Mr. CASGRAIN: To make it easily understood, how many offals would it take to make a ton of bacon?

Dr. SHUTT: That would depend on the nature of the offals. We have 80,000 tons live weight?

Hon. Mr. CASGRAIN: No, bacon?

Dr. SHUTT: Well, I suppose we might take this pig meat as bacon, it would represent 64,000 tons. We have 64,000 tons of meat produced by 597,000 tons of material.

Hon. Mr. CASGRAIN: Roughly speaking, it would take 9 tons of offals to make one ton of bacon?—A. Yes.

Hon. Mr. CASGRAIN: After reading this document from which you have quoted, would you recommend the 80 per cent?

Dr. SHUTT: Oh, yes, and I do it very strongly under the present conditions.

Hon. Mr. CASGRAIN: So that all the scientific terms and information boiled down means that you conclude by recommending us using 80 per cent flour?—Yes.

Dr. SHUTT: Yes.

Hon. Mr. CASGRAIN: And you agree with that?

Dr. SHUTT: I am of the opinion that under the present conditions it is very desirable, seeing that we must economise. Conservation of food is one of the matters under serious consideration. It is not necessary to support this contention by false statements in regard to the decay of the human race, from the use of white flour. There is no need for it at all, but we want to keep perfectly clear in our minds that bread from this 80 per cent flour would not be as digestible as that from 70 per cent flour.

Hon. Mr. CASGRAIN: Still, you recommend it?

Dr. SHUTT: I do.

Hon. Mr. DANIEL: You say 80 per cent flour is not to be recommended under ordinary circumstances?

Dr. SHUTT: No, I did not say that, I think there are undoubtedly some systems for which it will be valuable, there are also systems which will rebel for the reason that they will not be able to digest 80 per cent bread as well as 70 per cent. Under ordinary circumstances I should consider bread, say from 73 per cent flour is more suitable, better adapted to the majority of persons than bread from 80 per cent flour.

Hon. Mr. CASGRAIN: Is not that also because the human stomach is not accustomed to it at present?

Dr. SHUTT: No, I do not think so.

Hon. Mr. CASGRAIN: Would you recommend that it be used moderately? Not make the change abruptly.

Dr. SHUTT: No, these experiments have been carried out in a scientific way, and there is no doubt that the 80 per cent flour is a less digestible product than the 70 per cent, there is not a question of doubt about that.

Hon. Mr. CASGRAIN: I suppose there was no Hungarian milling in Canada before fifty years ago?

Dr. SHUTT: I dare say; I suppose that is right, I have not got the data.

Hon. Mr. CASGRAIN: Forty years ago there was a lot of good baking; how did they do that then when they had it all ground by the stones?

Dr. SHUTT: There is nothing to that, either one way or the other. The fact does affect the statements I have made and which are based on scientific investigations. No doubt the tendency in recent years has been towards an extremely white bread and the millers have met the demand. I think that the public have to a certain degree erred in the matter.

Hon. Mr. WATSON: They made just as good flour with the stones as they do with the roller process.

Hon. Mr. CASGRAIN: I think they made better.

Hon. Mr. WATSON: They extracted the shorts and middlings and bran at that time just as the millers to-day do with the roller process. With the roller process they are able to eliminate the germ better than before, and to my idea the closer you get down to starch and the more eliminate the foreign elements, that is the germ and the bran, the better the flour will keep. That was demonstrated by Adam Brown in the exhibition in Jamaica; it was supposed that our high grade flour would not keep and he demonstrated that it would.

Hon. Mr. CASGRAIN: How did it keep before the Hungarian milling?

Hon. W. B. ROSS: It did not keep.

Hon. Mr. WATSON: The lower the grade of flour you have, the more liable it is to spoil.

Hon. Mr. CASGRAIN: Because there is ferment in it, and the ferments are good; they help to digest it.

Hon. Mr. WATSON: That is what I thought, but in making a recommendation of this kind it should be stated whether the flour is recommended for domestic use or for export.

Dr. SHUTT: I have made my recommendation as emphatically as I think the occasion necessitates in favour of 80 per cent, as a war measure—simply as a war measure.

Hon. Mr. DANIEL: That is your recommendation?

Dr. SHUTT: Yes.

Hon. Mr. WATSON: Would you recommend that for export?

Dr. SHUTT: No, I said with regard to export that that matter would have to be taken into special consideration.

Q. You recommend 80 per cent for domestic consumption?

Dr. SHUTT: For domestic consumption. Difficulty might be found as regards keeping qualities if 80 per cent were exported. I cannot offer any definite information on that point. The condition of transportation, length of storage period, etc., would have to be considered.

Hon. Mr. RICHARDSON: There has never been a question of raising enough fodder for cattle and hogs; so, if there is a small percentage of the bran lost for cattle and hog feed, the hogs and cattle will not be at a loss for feed, because there has been in the world almost always enough cattle and hog feed.

Dr. SHUTT: If the bran is indigestible in the human system and not usable as human food, why not feed it to the cattle and hogs; there it might be of some use?

Hon. Mr. WATSON: I wanted to prove that only a certain portion of it has been lost, and, that being proved, even that saving for the hog is going to counteract the saving we make on the human food.

Dr. SHUTT: But you must not enter into any argument of this character as if the cows and the hogs did not form a part of human food, and as if everything that was fed to them was wasted. Their products, milk, bacon, beef, etc., we turn it to a very good account as food for ourselves.

Hon. Mr. RICHARDSON: There is no question of our ability in this country to raise animal fodder sufficient for all the cattle and hogs we can raise. One of our great losses is from frost on our wheat crops but that does not apply to oats, for they may be frosted and yet be good for hog feed, and oats contain more nutriment. If the cattle have sufficient feed without the 10 per cent offal, would you not strongly recommend the 80 per cent flour provided there is sufficient offal for the cattle.

Dr. SHUTT: I have recommended, as a war measure under the present circumstances, the raising of the percentage to 80 per cent, and I have based that recommendation on the facts that have been put before you to-day. I have emphasized that recommendation, and I see no object in endeavouring to make it still more emphatic, from an argument which is based merely on hypothesis. In this argument we can only discuss facts. Anyone who is feeding stock to-day knows that the prices are well-nigh prohibitive. There is no use in speaking about the farmer who has feed that he does not know what to do with, for such is not the case. Good quality cattle feeds are to-day at very high prices and there are some worthless feeds on the market unfortunately that are being bought at absurdly high figures. It cannot be the case in Canada that we have an excess of food for animals. Certain feeds are fetching such a price now that I cannot see how they can be used except for dairy cattle. I am not prepared to make any statement as to the amount of mill feeds available but with the present prices of feeds in general I think it would be a very great mistake to say there

is a superabundance of cattle feeds in this country. It is altogether another matter when we speak of coarse fodders, such as hay, ensilage, roots, etc.—they are in another class, but it must be remembered that in stock feeding such fodders must be supplemented by mill feeds, of the latter, known generally as the concentrates there is no superabundance at the present time. I imagine that, if there were, competition would reduce their price.

Hon. Mr. RICHARDSON: The price of these cereals demonstrate much more strongly than anything else the value of proper feed: for instance the price of oats has not varied more than 2 cents per pound, whereas the price of wheat has varied over 3 cents per pound. It was proven a while ago that oatmeal was stronger and better food than flour, it has more nutriment in it.

Dr. SHUTT: Cattle feeds are not usable as human food, whether they be dear or cheap, I think that ought to be self evident. The bran elements must be removed from wheat to produce a flour fit for human consumption, and the part so removed can be utilized profitably in stock feeding for the production of milk, beef, bacon, etc. That, I think, sums up the whole matter, as regards the present argument.

APPENDIX A.

FLOUR AND BREAD.

The manufacture of Flour and Bread Order (No. 2), 1917, is dated February 24, and by virtue of Regulation 2 F. of the Defence of the Realm Regulations, the Controller orders:—

1. Except under the authority of the Food Controller, no person shall manufacture any wheaten flour other than a straight run flour.

2. Except under the authority of the Food Controller, no person shall, after March 12, 1917, mill any wheat so that the percentage of the extract of flour obtained from the cleansed wheat ground in his mill during any month or other period is less than the percentage (hereinafter called the prescribed percentage) ascertained on the basis of the percentages set forth in the schedule hereto, or such other percentage as the Food Controller may from time to time prescribe. Provided always that the following adjustments shall be made in ascertaining the prescribed percentage: (i) The percentage applicable to any Argentine wheat shall be increased by $\frac{1}{4}$ per cent in respect of each half-pound by which the actual bushel weight of the Argentine wheat milled shall exceed the bushel weight specified as applicable thereto, and shall be decreased by $\frac{1}{4}$ per cent in respect of each half-pound by which the actual bushel weight shall be less than the bushel weight so specified. (ii) In any case where the total product of the mill in question is obtained exclusively from English, Scotch and Irish wheat, or any of them, the percentage shall be less by one than the percentage otherwise applicable.

3. (a) Except under the authority of the Food Controller, there shall, after March 12, 1917 be mixed with the wheaten flour not more than 15 per cent, and not less than 5 per cent, of flour obtained from rice, barley, maize, maize semolina, oats, rye, or beans, or any other cereal for the time being authorized by the Food Controller. (b) The mixture shall be made either by addition to the wheaten flour after it has been maled, or by milling the permitted cereals with wheat, or partly in one way and partly in the other way. In any case, rice shall be milled to a 95 per cent extraction, maize semolina to a 70 per cent extraction, and maize and barley to a 60 per cent extraction. (c) The mixture shall be made by the miller before selling or otherwise disposing of his flour.

(4) Imported flour shall be dealt with only in a manner prescribed by the Food Controller from time to time.

(5) Except under the authority of the Food Controller, no person shall, after March 26, 1917, sell or offer for sale or manufacture bread or any other article of food for which wheaten flour is used unless the wheaten flour used therein is flour which has been manufactured and otherwise dealt with as required by this Order.

(6) For the purpose of any statute, wheaten flour which has been mixed with flour obtained from rice, barley, maize, maize semolina, oats, rye, beans, in manner provided by this Order, or has been otherwise mixed in manner authorized by the Food Controller and does not contain any other ingredient, shall be deemed to be exclusively composed of wheaten flour.

(7) If any person acts in contravention of this Order, or aids or abets any other person in doing anything in contravention of this Order, that person is guilty of a summary offence against the Defence of the Realm Regulations, and if such person is a company every director and officer of the company is also guilty of a summary offence against these regulations unless he proves that the contravention took place without his knowledge or consent.

(8) This Order may be cited as the Manufacturer of Flour and Bread Order, No. 2, 1917.

SCHEDULE.

DESCRIPTION OF WHEAT.	Per cent.
Choice Bombay.....	83
Australian.....	86
Blue Stem.....	81½
Walla Walla (white and red).....	80½
Chilian.....	80
New Zealand.....	81
English.....	81
Scottish.....	81
Irish.....	81
No. 2 Club Calcutta.....	80
Choice Red Kurrachee.....	80
Soft Red Kurrachee.....	80
Rosafe, 62 pounds.....	78
Baril, 61½ pounds.....	78
Barletta Russo, 61½ pounds.....	78
No. 1 Hard Manitoba.....	80
No. 1 Northern Manitoba.....	80
No. 2.....	78
No. 3.....	76
No. 4..... (common grade).....	75
No. 5.....	72
No. 6.....	67
No. 4..... (spec. common grade).....	70
No. 5.....	63
No. 6.....	53
No. 1 Hard and Montana Winter (1916).....	82
No. 1 Hard Winter (Chicago or Atlantic Grading, 1916).....	81
No. 2 Hard Winter (Gulf Inspection, 1916).....	80
No. 2 Red Winter (Western), 1916.....	81
No. 2..... Seaboard Inspection, 1916.....	80
Steamer Grade Winters (1916).....	79
Red Winters, all other grades (1916).....	81
Canadian Winters red or white.....	80
No. 2 Chicago Spring (1915).....	77
Duram.....	77
Japanese.....	79
Feed wheat.....	43

ALFRED E. LABELLE, Managing Director of the St. Lawrence Flour Mills Company, was called as a witness, and testified as follows:—

MR. LABELLE: I have been in the flour business for thirty-six years. With the notice I received was a copy of Senator Casgrain's speech, in which he mentioned a paper by Dr. Nadeau, which I got, and I find that it is practically the same thing, the only difference being that the Senator treated the millers in a fairly decent way, while Dr. Nadeau called them all kinds of names—murderers, highway robbers; in fact, we are charged with every crime on the face of the earth except, perhaps, beating our wives. The millers have been doing nothing else for the last fifty years than simply trying to produce the best flour possible at the lowest cost, like every other industry. Unfortunately, there seems to be an idea in the public mind that it is always right to blame the miller or the baker if anything happens. If wheat goes up in price in Manitoba, and we put up the price of flour, we are a lot of thieves. Consequently the bakers have to increase the price of their bread, and they, too, are a lot of thieves. If wheat goes down, we are caught, because we have to keep a stock of wheat, and we drop 25 or 30 cents a bushel, but of course in that case we always deserve what we get. But as Dr. Shurt says, when you have a good case there is no need to bring in a lot of lies to prove it, it is sufficient to show whether it is good or bad. The first correction I want to make in Senator Casgrain's speech is this. He talks about 82 per cent extraction, and Dr. Nadeau goes as low as 58 per cent, while the modern mills are making 74 or 75 per cent of good bread flour from wheat. We can extract different qualities but it all goes for bread, for good food, except the low grades, which are sometimes extracted in the case of high patents, but there is the large amount of extraction when

the flour is made straight—and lots of flour is made straight. If you have a good grade of wheat, you can make a straight grade up to 74 per cent. If you have poor wheat you may have to take a percentage lower than 74 per cent. So the percentage starts not at 62 as stated, but at 74. 85 per cent has not been tried as far as I know, the highest extraction has been 81 per cent. It has been tried in Europe, and has not been proven satisfactory. All authorities pretty well agree that flour should not be extracted to more than 76 per cent, to get a good flour, free from germs and impurities. Belgium has used a flour of a higher extraction than that. The American Relief Committee supplied 82.4 per cent, but this has been proven by Mr. Hoover, the Food Commissioner of the United States, who was in control of that committee to be most unsatisfactory, and the children there to-day have all to be fed in a special way to make up for the harm they suffered by using this flour for such a long while. On the other side, they are not getting any satisfaction out of the 81 per cent flour; and it is useless for us to talk of 80 per cent flour when on the other side they are all feeling that such high extraction is not giving satisfaction.

Hon. Mr. DANIEL: In what way is it not giving satisfaction?

Mr. LABELLE: It has been too easily digested, causing dysentery and diarrhea. The most horrible things are charged against white bread. The Senator also talks about the stone milling being the ideal milling. Now, anyone acquainted with stone milling knows that in milling wheat on stone you mix it all up; that is, the bran gets some flour and the flour gets some bran and dirt, and the dirt is saturated into the two. The Senator mentions that the stone mill have a good flour and poor bran, while the roller mills are doing exactly the contrary. Now, the fact is exactly the reverse. Dr. Nadeau tells us in his paper that the farmers of the country used to pay twice the price on mill offals from roller mills than they would from the stone. Go and ask any farmer who brought his wheat to the mill whether he would pay the same price for the bran sold by the local dealer, or whether he valued his own bran more, and I think Senator Watson, who knows about milling, knows that that is the case.

Hon. Mr. WATSON: The hog and the dairy cow prefer the stone milling.

Mr. LABELLE: As to the keeping qualities, it is pretty well agreed that the higher percentage flour will not keep as long as the other, and of course that is another charge against the miller and the dealer and the baker. According to the Senator, we load up with flour and keep that for years, because it keeps well, and when the price goes up we sell. Any man would know that if our flour would not keep, it would cost a good deal more to make flour. That is easily explained. In the milling industry we want to reduce the cost of our manufacture, so we must run our mill on exactly the same quantity right along, and run it the whole year; that is the only way to reduce our expenses. In some months we are bound to sell more than in others. In a month of low sales we accumulate stock; in the next month that stock is disposed of with the new grinding. Indeed, I do not think you will find one mill in the whole country that has more than a month's grinding of flour, and that thing changes several times a year. That is my experience, and I think it is everyone's.

Hon. Mr. CASGRAIN: Would not 80 per cent flour keep a month?

Mr. LABELLE: No.

Hon. Mr. CASGRAIN: How long would it keep?

Mr. LABELLE: It is most irregular in its keeping. I have had flour that I have ground for the English Government which kept well for two months, and I have had flour that went wrong in two weeks.

Hon. Mr. CASGRAIN: What was the percentage of that flour?

Mr. LABELLE: 80 per cent. It kept in one case and in another case it went wrong.

Mr. PRICE: Is it not a fact that you send the low-grade flour to the West Indies and other hot countries, and that although that part of the flour contains more germs than the high patent, yet you had no difficulty with the flour keeping?

Mr. LABELLE: Yes.

Mr. PRICE: Have you ever had any complaints about that part that is shipped to hot countries not keeping?

Mr. LABELLE: No.

Mr. PRICE: And yet that contains much more of the germ?

Mr. LABELLE: Yes, but not as much as the 80 per cent. What I mean is that the low-grade flour we send to the West Indies is extracted from the 74 per cent or 75 per cent flour.

Hon. Mr. WATSON: You have not the high qualities of the wheat in that flour at all?

Mr. LABELLE: No.

Hon. Mr. RICHARDSON: Suppose you make from a bushel of wheat 39 or 40 pounds of patent there would be 3 or 4 pounds of low grade?

Mr. LABELLE: Yes, there would be 6 per cent low grade out of the whole of the flour.

Mr. PRICE: The flour you send to the West Indies, and which has proved its capacity for keeping, has a greater percentage of germ than if you were to make a 76 per cent flour straight and send it?

Mr. LABELLE: No, because there is practically no germ in the low grade. The germ goes into the feed; we sell our germ with the feed; it goes to the middlings. There might be a little more in the low grade than in the other.

Hon. Mr. WATSON: In the 80 per cent you are taking all the flour and part of the germ and the bran?

Mr. LABELLE: Not the bran, but the fine shorts.

Hon. Mr. WATSON: In the low grade flour you eliminate about 40 per cent of your high-grade flour, and the balance goes practically as a feed?

Mr. LABELLE: I do not understand your question.

Mr. PRICE: You have more fermenting, though.

Hon. Mr. WATSON: No, you have the germ, but you have not the other material for the germ to operate on, to cause fermentation?

Mr. LABELLE: You take bran for example. Bran will keep for years. It is a much lower grade, while Red Dog, which is between flour and feed. Red Dog will very often produce flies in a month.

Mr. PRICE: Because it has a lot of sugar?

Mr. LABELLE: A lot of sugar and germ and everything else.

Mr. PRICE: It is only for the reason that it contains more sugar?

Mr. LABELLE: More sugar and more germ. Now, it would be impossible, as suggested in the Senator's speech, to make flour from hand to mouth, that is for every day's supply. That might be well enough in Beauce county, where a mill might make fifty bags a day; but how would a big mill run that way? Our flour goes to places where it is kept for over six months. Take the Gaspé Coast. We ship in October and they have to keep using it until the following May. Many of our nearer villages would be in the same way.

Hon. Mr. CASGRAIN: Would it go bad?

Mr. LABELLE: It would certainly go bad in a certain time, that 80 per cent flour.

Hon. Mr. CASGRAIN: 80 per cent flour if kept in a cold place, at 33 or 34 degrees temperature?

Mr. LABELLE: I do not see how you can figure on the flour being kept at that temperature. There is always a certain proportion that is left over.

Hon. Mr. DANIEL: There is one thing I would like to find out. Would there be any difference in the cost of the flour as between the 80 per cent and what you usually manufacture? Would it be cheaper or dearer?

Mr. LABELLE: It would be cheaper.

Hon. Mr. DANIEL: The 80 per cent?

Mr. LABELLE: Yes, because of the proportion of the low-grade flour that you would gain. You would gain the difference between the value of that flour and the value of the offal, which is not worth so much.

Hon. Mr. DANIEL: That is, you would make more money by milling 80 per cent wheat than you would by miling 74 per cent wheat and getting the price of the offal from it?

Mr. LABELLE: If we sold it at the same price, certainly.

Hon. Mr. DANIEL: You get the price of flour for what would otherwise become offal?

Mr. LABELLE: Yes.

Hon. Mr. WATSON: One is worth two cents a pound, and the other is worth six cents a pound.

Hon. Mr. DANIEL: Could you give me an idea of what is the difference in the price of your ordinary manufacture, 74 per cent, and the 80 per cent wheat?

Mr. LABELLE: The difference between 74 and 80, that would be 6 per cent, would it not? You would gain the difference in value between your offal, which, I suppose, is worth to-day two cents a pound, and the flour, which is worth six cents a pound, would make 24 cents a barrel.

Regarding the different articles, alum, talcum, boric acid, salicylic acid, and those, I do not know anything about them. The only thing I know about talcum is that it is used as talcum powder. But the statement made in this publication is an absolute falsehood, and I want to say here I think it is simply a shame that the Minister of Agriculture of the Province of Quebec should allow a book of this kind to go unchallenged. The men engaged in one of the greatest industries in the country are accused of all kinds of crooked practices, and the Minister puts his name to that. There should be an inquiry at once, and if in the milling or baking industries any persons are found guilty of doing such things, they should be arrested and put in jail and kept there for the rest of their lives. It is simply an outrage that the thing should ever have been allowed to go out.

So far as saving is concerned, I think it would be better for the Government to decide to mix in other grains. I do not think it is necessary, mind you, but I think it would be the best way to get your flour pure and get the other products pure, and mix them together.

Hon. Mr. CASGRAIN: Pea meal?

Mr. LABELLE: Pea meal, or corn meal, or bean meal. That is the only way the public would not be fooled, to mix those together if it is necessary; but I do not think it is.

Hon. Mr. WATSON: What guarantee would you have as to the percentage of the mixture?

Mr. LABELLE: That is for the Government to control. For myself I do not think it would be of any use, but if you want to have more human food, I think you would get better results by mixing in those grains than by changing your percentages. I do not think it is necessary, because I believe that every bit of grain that is grown is used, whether for human food or as offal. So what you lose one way you gain the other, and it seems to me the results would not warrant a change, the difference would be too small.

One thing I have to say in conclusion is that milling is one of the largest industries in the world. I think more money has been invested in mills than in any other

industry, and all these mills have been spending money for 50 years, simply for the purpose of trying to do better. All kinds of modern machinery have been installed in order to get the best results; they have been employing the best chemists, and so on, and it would be very strange if the whole business was wrong and Dr. Nadeau and Dr. Rousseau were right, and the whole industry would have to stop and go back to where it was 50 years ago. It would be just as well to tell people that because some of our ancestors did not take a bath very often or ventilated their houses, or even not very particular about the hygiene laws that it is dangerous to do exactly the contrary now. It is the same with every other article manufactured. To-day we find that boots are manufactured by big shoe factories on better terms than the little shoemaker could make them. It is the same with regard to clothing, and so on. Flour seems to be the only article that has to go back, according to these so-called food experts.

Hon. Mr. CASGRAIN: Out of one bushel of wheat, how many pounds of flour, patent flour, on the average, do you get?

Hon. Mr. WATSON: Of No. 1 Northern Wheat?

Mr. LABELLE: 76 per cent of 60 pounds.

Hon. Mr. CASGRAIN: How much would that be?

Mr. LABELLE: That is 44½ pounds.

Hon. Mr. RICHARDSON: After taking out the low-grade?

Mr. LABELLE: No, no.

Hon. Mr. CASGRAIN: I asked about patent flour, straight grade.

Hon. Mr. RICHARDSON: How much would it be after taking out the low-grade?

Mr. LABELLE: About thirty-nine and a half pounds.

Hon. Mr. WATSON: Say six per cent low-grade?

Hon. Mr. CASGRAIN: Is that patent flour?

Mr. LABELLE: No, not patent flour.

Hon. Mr. WATSON: Say 76 per cent.

Mr. LABELLE: Make it 74 per cent, the lowest extraction. In 74 per cent you have, say, six per cent low-grade. From that you have straight Strong Bakers, it can also be divided into patent and Strong Bakers, both used for bread.

Hon. Mr. WATSON: What Senator Casgrain wants to know is how many pounds of straight grade flour?

Mr. LABELLE: You would get seventy pounds of good flour.

Hon. Mr. CASGRAIN: Oh, there are only 60 pounds in a bushel of grain.

Mr. LABELLE: I mean 70 per cent, that is 42 pounds of flour.

Hon. Mr. WATSON: High-grade flour?

Mr. LABELLE: That is straight flour. I am figuring now one and two wheat.

Mr. R. M. PRICE: Would you say, Colonel, that the average flour used in Canada is produced at the rate of 42 pounds to the bushel?

Mr. LABELLE: Yes.

Mr. PRICE: That is larger than I thought.

The CHAIRMAN: You get a 98-pound bag out of 150 pounds of wheat?

Mr. LABELLE: More than that; that would be a five-bushel yield, which would be very high.

The CHAIRMAN: They say it takes two and a half bushels of wheat to make a 98-pound bag of flour.

Mr. LABELLE: It does not take that much. The yields now average four and three-quarter bushels to the barrel; that is 285 pounds.

Hon. Mr. RICHARDSON: I thought a barrel of flour could be made out of four and one-third bushels of wheat—good, hard wheat. That is what I have always been told.

Mr. LABELLE: Some crops have done it. We have had some crops that were around four bushels and twenty pounds; but we have not had such a crop for several years now.

Hon. Mr. CASGRAIN: Last year's crop of No. 1 Northern must have come very close to it.

Mr. LABELLE: I am not talking about No. 1 Northern; I am talking about the average milling mixture.

Hon. Mr. WATSON: I think Senator Casgrain will attain the object of his question better by taking a particular grade of wheat, No. 1 Northern, which has practically the same value for milling every year.

Mr. LABELLE: The figure I am giving you now, of seventy-four or seventy-five per cent, is based on 265 pounds of cleaned wheat, as it gets to the rolls, which means four bushels and twenty-five pounds. With lower wheat you will have a different percentage of flour.

Hon. Mr. WATSON: That would be No. 2 or No. 3 Northern?

Mr. LABELLE: That would be No. 2. With No. 3 you would get less, with No. 4 less again, and so on.

Hon. Mr. CASGRAIN: Do you contradict the statement of Dr. Shutt, the Dominion chemist, and also those English authorities that he quoted?

Mr. LABELLE: Yes.

Hon. Mr. CASGRAIN: You contradict his statement that it would be better to have 80 per cent flour?

Mr. LABELLE: Yes, and I contradict it for this reason.

Hon. Mr. CASGRAIN: You contradict the Cambridge University authorities?

Mr. LABELLE: Certainly. Those people based their statement on conditions in England. The actual experience does not seem satisfactory over there. We are not in the same conditions here at all. There is no question just now of there being not enough wheat to go around in Canada. This year there should be enough for the whole of America.

Hon. Mr. CASGRAIN: Have you read what the Food Controller says: that we must cut down our requirements?

Hon. Mr. RICHARDSON: Of course, we are not figuring upon our own requirements alone; we are figuring upon the requirements of ourselves and our Allies.

Mr. LABELLE: I understand. I think it is all right enough to get people to economize, but I am of the opinion that there is enough wheat in this country and there will be enough left after what we can give the others, because you must remember that the Allies are limited by the number of boats available, and so on.

Hon. Mr. RICHARDSON: We know this, that the reserves we had in 1914 disappeared.

Mr. LABELLE: Yes.

Hon. Mr. RICHARDSON: We know that; and, furthermore, that we are depending upon what we get this year. Neither you nor I know what we shall get this year.

Mr. LABELLE: No.

Hon. Mr. RICHARDSON: Going back to 1915, the crop of winter wheat in 1915 was the greatest crop America ever saw. What did we get? In the harvest was it not ruined, right from Texas to Ontario? There was hardly a barrel.

A. J. BANKS, chemist, of the Ogilvie Flour Mills Company, Montreal, was called as a witness, and testified as follows:—

Mr. Chairman, early in the current month, the Hon. Mr. J. P. B. Casgrain suggested to Mr. W. A. Black, the managing director of the Ogilvie Flour Mills Com-

pany, Limited, that he should appear before this committee to give evidence on the subject of whole wheat bread. Mr. Black replied that he would be pleased to have the chemist of the company—namely, myself—do so, as the question of the advisability of adopting the so-called whole wheat bread in Canada was one bearing upon the chemistry of nutrition rather than upon the technical or commercial aspects of milling. The miller can produce from the wheat berry any desired combination of its contents, highly ground or merely crushed, and he felt it was better for the chemist to advise as to the results of such combinations on the human system. Mr. Black also felt that certain statements made by the Hon. Mr. Casgrain in his speech, copies of which were supplied to him by the secretary of your committee, required correction, and with your permission, honourable gentlemen, I will deal with those points.

The expression "whole wheat" implies the use of the entire berry. This, I think, is contrary of the intention of the honourable gentleman, who seems to have obtained his inspiration from *La Presse*, and Dr. Aurele Nadeau's book, "The Great Fallacy of White Bread," wherein entire wheat flour—that is to say, an equivalent of about 85 per cent extraction of the wheat berry, or the entire flour of the berry minus the coarse bran—is the product called for.

Hon. Mr. CASGRAIN: What is the percentage of the flour that they are shipping?

Mr. BANKS: It is about 76 per cent extraction.

A perusal of Dr. Nadeau's book, which is extremely laboured in its denunciation of white bread as well in its praise of the so-called natural bread, leads one unavoidably to the conclusion that it is but a digest of the views of others, mainly French writers. There is a marked lack of evidence of the writer having undertaken any investigation of home or local conditions. Whilst being cognisant of a partiality for white flour and bread of low gluten content, on the part of the French people,—I do not mean the French Canadians—I must admit that I entertain very grave doubts of the conditions being, in normal times, as serious as portrayed, and if such trade practices as are indicated do really exist an investigation would have proved that they are totally at variance with the conditions and practices prevailing in this country.

On page 2 of the honourable gentleman's speech, I find that he says Great Britain and France have adopted the use of whole wheat bread. Let me state that such is not really the case, as evidenced by the fact that Ogilvie's and other Canadian mills have forwarded and are still forwarding millions of pounds of flour in which none of the coarser stocks, are included; and in fact, a percentage of the lower grade of flour has been removed.

The statements on page 2 respecting the mineral constituents of "natural bread" and white are grossly misleading, inasmuch as we are told that white bread contains hardly any of them because they are nearly all extracted. Dr. Henry C. Sherman, Professor of Food Chemistry at Columbia University, gives the following values, stated in grammes per pound: White bread, .13 grammes per pound of lime, .89 of phosphorus, iron, .004; whole wheat bread lime .18, phosphorus 1.78, iron, .007; beef, medium fat brisket, .05 of lime, 1.28 of phosphorus, .008 of iron; beef, porter house steak, lime .06, phosphorus 2.01, iron .013; beef rump, lean, lime .06, phosphorus 1.86, iron 0.12.

What I should particularly like to call attention to is the fact, that taking bread at 8 cents per pound, beef brisket at 20 cents a pound, porterhouse steak and rump of beef at 35 cents per pound, we get the following values per dollar, these figures are also expressed in grammes per pound: White bread, lime 1.62, phosphorus 11.12, iron .05; whole wheat bread, lime 2.25, phosphorus 22.25, iron .09; beef, medium fat brisket, lime .25, phosphorus 6.40, iron .04; beef, porterhouse steak, lime .17, phosphorus 5.74, iron .037; beef, rump, lean, lime .17, phosphorus 5.31, iron .034. These figures plainly show that the purchasing power of \$1 with respect to these highly prized lime, phosphorus and iron compounds, is fully twice as great in white bread as in the general average of beef, and four times as great in the case of the

whole wheat bread. With respect to the higher apparent value of whole wheat bread I will have something to say in the course of a few moments.

In another series of comparisons Dr. Sherman gives the following analyses of similar bread made from different grades of flour:—

	Water.	Protein.	Fat.	Carbohy- drates.	Fibre.	Ash.	Fuel Value Calories.
White bread from high grade patent flour	32·9	8·7	1·4	56·5	.....	0·5	1235
White bread from regular patent flour...	34·1	9·0	1·3	54·9	.....	0·7	1212
White bread from bakers' grade flour....	39·1	10·6	1·2	48·3	.....	0·9	1117
White bread from lower grade flour.....	40·7	12·6	1·1	44·3	.....	1·3	1078
Whole wheat bread, 12 analyses.....	38·4	9·7	·9	49·7	1·2	1·3	1113

The protein content based upon the percentage of dry solid matter in these samples would be:—

	Per cent.
White bread from high grade patent flour.. . . .	12·96
“ “ regular patent flour.. . . .	13·65
“ “ bakers' grade flour.. . . .	17·40
“ “ low grade flour.. . . .	21·25
Whole wheat bread.. . . .	15·74

I mention this matter to emphasize the influence of moisture content as the data by the honourable gentleman, namely, 85 grammes of gluten per pound of whole wheat bread, and 40 grammes per pound of white bread are equivalent to 18·7 per cent respectively, are clearly at considerable variance with the general facts of the case.

The statement was probably made to add weight to the contention that 85 men can be fed with whole wheat bread made from the same quantity of wheat which would if made into ordinary white bread, feed only 62 men. We are also told that the Government can put a measure on the Statute Book whereby we can get 25 per cent more nutriment out of the whole wheat than we are getting to-day. If that is so, there have been some terrible blunders made, there has been an appalling dietetic and economic wastage permitted in the past, and curiously enough, this has occurred among the nations which are generally admitted to be among the most enlightened. Let us see if, by the use of whole wheat bread whether four men can be fed instead of the three now being fed with the commercial bread in use. Already extensive research of the most careful and prolonged character has been undertaken with the view of elucidating the problems surrounding the nutritive qualities of the wheat berry. A very considerable amount of this work was undertaken by our neighbours in the United States, and the bulletins of the Office of Experiment Station of the United States Department of Agriculture abound with information of the most conclusive nature. These researches were instituted, not for self glorification, not to secure individual popularity; they were not backed up by any commercial or financial interest; they were instituted by the Government for the benefit of the world at large. The aim was to secure the unshakable and absolute truth, irrespective of the direction it might take or the influence it might have upon commercial interests. In those days, some sixteen years ago, Professor Harry Snyder was the chemist in charge of the experimental station of the Department of Agriculture in Minnesota, and for a period of about ten years he devoted much valuable time and technical skill to the investigation of digestion experiments, made largely upon human beings, and confirmed by chemical or laboratory methods. Professor Snyder avoided complications resulting from differences of composition in the raw materials by making use of one common stock of wheat, which, after cleaning, was milled to yield three separate types of flour, namely, a standard patent grade, or white flour; and entire wheat flour representing 81 to 82

per cent flour extraction, and a whole wheat product. I do not propose to deal with these reports in detail, they are much too lengthy and exhaustive, but with your kind consent I will refer to some of the conclusions. I quote in condensed form the result of one research published by the Department of Agriculture in Washington, in 1901, which shows:—

Flour.	Total.	Protein Available.	Assimilated.	Total.	Carbohydrates.	
					Available.	Assimilated.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Stand: Patent.....	11.99	10.2	85	75.36	73.5	67.5
Entier wheat.....	12.26	9.9	80	74.99	69.3	92.25
Whole wheat.....	12.65	9.8	77	73.67	66.3	90.00

Protein is the index of strength production whether it be in vegetable or animal food, and, whilst the whole wheat product showed the highest percentage of protein, it gave in chemical digestion experiments, as well as in actual trial upon human beings, the lowest efficiency of the series, in fact, each addition of parts of the berry other than the true flour yielding portion or endosperm produced a product of less nutritive value than that of ordinary white flour. The lower digestibility of the flour grades containing more than the endosperm, or in other words those to which some portion or the whole of the outer branny covering was added, is due to the fact that a considerable portion of that material is contained in the coarser particles, and resists the action of the digestive juices and thus escapes digestion. Professor Snyder concluded that "the nutritive value of the food was not increased by milling the wheat so as to retain a large proportion of the bran and germ, as in the entire wheat or whole wheat flours."

In some further studies on the digestibility and nutritive value of bread, published in Bulletin 156, a white straight grade flour alone, and with an admixture of finely ground bran was investigated and a similar result was obtained. The comparison of the total and digestible nutrients and total and available energy in the same flour with and without bran shows:—

Kind of Flour.	Protein N x 6.25.			Carbohydrates.			Energy per gram.	
	Total.	Digestible.	Assimilable.	Total.	Digestible.	Assimilable.	Total Calories.	Available Calories
	%	%	%	%	%	%		
Straight grade with bran added	15.35	13.19	85.9	72.23	67.46	93.4	3876	3395
Straight grade without bran	15.06	13.69	90.9	73.57	71.88	97.7	4040	3721

The inference deduced from the above result was that the addition of even finely ground bran decreased the digestibility of the product, and though the bran flour contained a larger percentage of protein than the flour without the bran, in consequence of its lower digestibility the nutritive value was actually less.

In 1897 Plagge and Lebbin, and in 1898 Pannwitz published in Berlin the results of a study of different sorts of army bread. They took into account the effect on digestibility of different proportions of bran. In their experiments the diet consisted of bread alone. Their data are rather numerous, but as typical of the general run, I may mention the following examples:—

	Coefficients of Digestion of different sorts of bread.	
	Dry Matter.	Protein.
Coarsely ground rye, no bran removed "pumpernickel"	84.34	47.96
Coarse decorticated rye flour with 15 per cent bran removed . . .	87.76	58.56
Finely ground decorticated rye flour with 10.84 per cent bran removed.	87.76	66.38
Finely ground undecorticated rye flour with 12.68 per cent bran removed	87.39	60.88
Finely ground undecorticated rye flour with 25.00 per cent bran removed	90.51	66.25
Entire rye bread made from crushed grain without previous grinding	78.59	49.65
Fine wheat flour with 30 per cent bran removed	93.93	81.31

The above examples all go to show that the higher proportion of bran reduced the percentage of nutrient matter assimilated.

HON. MR. CASGRAIN: You say that bran does not digest.

MR. BANKS: And proportionately it seems to have a restricting influence.

HON. MR. CASGRAIN: It prevents the starch being digested.

HON. MR. DANIEL: It gives bulk without nutriment.

MR. BANKS: Yes.

HON. MR. CASGRAIN: How is it that the doctors recommend it to people who are sick?

MR. BANKS: I do not know that they always recommend it. Now and again it may be necessary in the case of persons more or less troubled with costiveness. It may be advisable in lieu of administering laxatives. The conclusion was reached that the value of flour depended upon the amount of bran removed, and that bran, even if finely ground, was not suitable for human food.

Lawes and Gilbert, who rank among the foremost English chemists, who paid particular attention to agricultural problems, many years ago stated that the poorer classes in England almost invariably preferred white bread. This preference is founded on the fact that the coarser and more branny bread passes through them before their systems have extracted as much nutritive matter as it ought to yield. These chemists also emphasize the importance of the state or condition of foods as well as the chemical constitution; in other words, digestibility and aptitude for assimilation are not less important than the composition.

At a bakers' conference held in Chicago on the 17th and 18th of May last, Professor Snyder prepared and read a statement on "How can the Baker best serve his Country?" He said, "Among the suggestions that have been made for the relief of the bread situation the following: (1) Grinding more of the wheat kernel into flour and less into feed; (2) making a more extensive use of other cereals for bread making; (3) elimination of waste in use of flour and bread. Drastic punishment should follow any attempt to adulterate flour or bread, or to create conditions in order to make unreasonable profits." In dealing with the matter of grinding more of the wheat kernel into flour and less into feed, he rightly expressed the view that the advocate of gray bread argues that by the addition of 7 per cent to 8 per cent of the present mill by-products of wheat to flour the wheat crop and flour supply would be made to go that much further. The theory that grey bread will relieve the situation is based upon the assumption that pound for pound it is equal in food value to white flour bread, and that the present uses of the wheat by-products give little or no return as human food. Professor Snyder referred to the bulletin of the Office of Experiment Station of the United States Department of Agriculture, Bulletin 101,

page 33, the available heat of combustion of standard patents or straight flour is 3,650, and of entire wheat (82 per cent) 3,445 per unit, from which he draws the conclusion that 106 parts of whole wheat flour are the equivalent of only 100 parts of the straight grade white flour. Bulletin 156, page 37, arrives at a value of 107.7, whilst a third estimate gives 106.7.

I understand that in England the annual per capita consumption of flour is 280 pounds. On a basis of 72 per cent extraction, this is equivalent to 6.5 bushels of wheat. Statistics show that the yearly per capita consumption of wheat in the United States is 5.2 bushels. In view of the fact that we consume more corn products than England, and much less than the United States, we may with safety regard the Canadian annual per capita consumption of wheat as being 6.25 bushels, which on a basis of 72 per cent extraction is equivalent to 270 pounds of white flour. To obtain the same amount of energy from 81 per cent extraction it would be necessary to consume a little over 286 pounds of the grey product. It will thus be seen that these figures which are fully confirmed by human and chemical digestion experiments fall very short of a confirmation of those stated by the Hon. Mr. Casgrain. The quantity of wheat which now feeds sixty-two men, if milled to 81-82 per cent extraction—that is to say, if the whole of the flour was removed,—would feed only 65.8 men, an increase of 6 per cent instead of the 37 per cent claimed by the honourable gentleman. If the bread consumption is to remain at the customary figure the adoption of 81-82 per cent extraction will be equivalent to reducing the weight of the pound loaf from 16 ounces to 15 ounces, and this must of necessity tell most severely upon the poor people. It is therefore very manifest that in making an 81-82 per cent flour extraction we simply add to the bulk of the flour produced, but we do not increase its nutritive value.

Experience gained in the feeding of stock fully demonstrates that bran is of less value than wheat middlings; the starch of the flour is more valuable in the middlings feed than are the woody matters of the bran. It is the opinion of agricultural and live stock interests that the introduction of an 81-82 per cent flour extraction would disorganize the industry, increase prices, and decrease the supply of animals raised for food, inasmuch as it would necessitate a reduction of 30 per cent of the wheat offal. After the introduction of a similar scheme in England, the price of offal increased £2 per ton.

Reverting again to Professor Snyder's able exposition, we find it stated that if man consumed the white flour and the cow consumed the bran and other wheat offal, over 90 per cent of the total energy of the wheat is utilised, but if man consumes 82 per cent flour and the cow gets the restricted wheat offal from this flour, only about 84 per cent of the energy of the wheat is secured. The same relative amounts of available protein are utilized.

On pages 2 and 3 of the honourable gentleman's speech we are told that the white flour of to-day is esteemed because it keeps so well. We are told that it keeps well because it is dead, because all that is alive in the wheat is carefully separated and removed from all that is dead, and that there are no ferments left in it. We are also told that gluten, for instance, and fatty substances are likely to make the flour turn sour. We are told that all the valuable ingredients have been stolen from the wheat before it reaches us, and that all that remains is a mass of starch, with none of the ferments to make it easily digestible and none of the nutritive mineral salts to sustain life.

Well, honourable gentlemen, during the past twenty-five years I have been intimately connected with the scientific and technical sides of the fermentation, milling, and baking industries; I studied the science of bacteriology and ferments at King's College, London, under Professor Hewlett, whose published works are regarded as classics in that line. Moreover, I have personally examined many hundreds of thousands of samples of flour, and I can honestly assure you that I have not yet found a single sample free from either ferments, mineral salts, or gluten. As a

matter of fact, it is our daily practice at the Ogilvie mills to determine the regularity and the degree of vital activity of these ferments in each grade of flour. We place more reliance upon the determination of the degree of activity and the peculiarities of the ferment than we do upon any other feature. It is a physical impossibility to remove the ingredients from the flour in the ordinary course of milling. The superior keeping qualities of the white flour of to-day are the direct result of greater purification and the removal of those extraneous fungus and bacterial growths which adhere so tenaciously to the branny coverings of the wheat. In other words, it is the efficient removal of the closely adherent dirt and its microbial colonies that accounts for this desirable feature.

Hon. Mr. DANIEL: What about the germ?

Mr. BANKS: This goes along with the offals or branny parts of the grain. The germ could be dried, and if it were not of such a mucilaginous character it would be satisfactory. In the old country we made what was known as banana flour. This flour was manufactured from bananas from the West Indies. They were dried and ground into flour, then mixed with a fairly large proportion of the wheat germ. In order to ensure keeping qualities, the wheat germ had to be thoroughly dried by heat.

Hon. Mr. CASGRAIN: You had to kill everything in it.

Mr. BANKS: With the exception of the ferments and the germ itself. It was heated and dried out to a sufficient degree to prevent bacterial life. Under those conditions it will keep satisfactorily, but such conditions rarely obtain in ordinary flour milling.

Hon. Mr. DANIEL: It is not the oily contents of the germ when retained in flour that creates rancidness. It is the bacterial growth.

Mr. BANKS: That is a rather different feature. The rancidity is caused by the oxidation of the oil; but, in addition there is produced a very marked degree of acidity due to the action of the ferments inducing decomposition of protein, and aiding bacterial life. If the conditions favourable to bacterial life are removed, and the moisture content is low, flour will keep almost indefinitely—barring a degree of rancidity dependent upon the oil content.

The CHAIRMAN: You overcome that condition by heat.

Mr. BANKS: It is not so much that as reducing local conditions. Wheat germ heated to a temperature of above 155 degrees Fahrenheit is much more stable than ordinary wheat germs heated to a less degree.

The CHAIRMAN: Most of the bacteria are killed at a lower temperature than the germ of the wheat, I suppose.

Mr. BANKS: No, I do not think I would agree with that. Sometimes in sterilizing preparations for bacteriological work it is necessary to superheat them, and in ordinary sterilizing bacterial solutions or solid media it is necessary to heat them for approximately half an hour a day for a period of five days. The first day the old bacteria are killed; the second day the younger bacteria are destroyed, and on the third day the remainder succumb; finally the spores of spore-bearing organisms are destroyed, and a state is reached of such sterility that the media will keep almost indefinitely. A much less drastic treatment would suffice to destroy the life of the wheat germ, and induce conditions inimical to bacterial development.

Hon. Mr. DANIEL: It is like pasteurizing milk.

Mr. BANKS: It is very much the same as pasteurizing milk.

In the last paragraph, page 3, we are told that the bakers do not want to deal with whole wheat bread because there is not so much money in the making of it. The cost of production of bread is of course a variable item. In some instances whole wheat bread does cost more than ordinary white bread; on the other hand when made of a plainer type, when made without the addition of expensive lard, malt flour and sugar, it is produced at less cost than white bread. I have, during the past fifteen years, had

many opportunities of watching the rise and fall of sporadic attempts to convert the general public to the view that the flour or high extraction is more palatable, more nourishing and more healthy than white bread, and I have within the past few days interviewed some of the largest commercial bakers in Montreal to ascertain their views respecting the cost and the demand of the various kinds of whole wheat bread, and I find, as already stated, the cost of production varies from .73 cents less, to 2.5 cents more per loaf than white bread; but the demand is, in each case, extremely small.

Hon. Mr. CASGRAIN: It cost more than the white flour.

Mr. BANKS: It is from .73 cent less to $2\frac{1}{2}$ cents more per loaf than white bread.

Hon. Mr. CASGRAIN: You mean to say it costs more?

Mr. BANKS: It may cost .73 cent less.

Hon. Mr. CASGRAIN: Does it cost more or less?

Mr. BANKS: From .73 cents less to $2\frac{1}{2}$ cents more, according to what is put into it, according to the extra ingredients. If it is made from practically straight grade flour without any additions of sugar, malt, milk, shortening, lard, or such like additions, it can be made cheaper than white bread. If, on the other hand, there is an attempt to introduce additional flavors, or the further addition of malt or sugar or more or less lard or butter, eggs, and so on, it costs proportionately more.

Hon. Mr. CASGRAIN: It all goes into bread,—lard, and all that stuff?

Mr. BANKS: Oh, yes, very largely; particularly in cities, though not so frequently in the country.

Mr. PRICE: You are dealing now with the cost to the baker baking the bread.

Mr. BANKS: Yes.

Mr. PRICE: Did you say the baker could produce it at .73 cents less if he does not attempt to load it up with malt, and milk, lard, and sugar, and so on?

Mr. BANKS: Yes.

Mr. PRICE: If the baker pays 7 per cent, how much less can a miller make 76 per cent flour than he makes the ordinary product of his mill? There are two sides to this—not only to reduce the cost of living by lowering the price, but by enlarging the amount available; that is what you are getting at, Senator?

Hon. Mr. CASGRAIN: Yes.

Mr. BANKS: I think that matter was dealt with by Mr. Labelle this morning.

Mr. PRICE: I would like to have you deal with it.

Hon. Mr. CASGRAIN: All the flour mills are against this thing, and they employ chemists to make scientific statements to fight against it.

Mr. BANKS: I think you are wrong in saying that they employ chemists to fight against it. Their aim is toward the improvement of what they are making, rather than the destruction of other products.

The returns of white bread vary from 3 to 5 per cent, whilst those of whole wheat bread range from 15 to 20 per cent.

Hon. Mr. DANIEL: Are you referring to the price of bread?

Mr. BANKS: No, it is a matter of demand, and is independent of price. The bakers are not averse to supplying it. You will find they have returned from 3 to 5 per cent of white bread as a result of excessive competition, and the overloading of stores, whereas in the case of brown bread the returns are 15 to 20 per cent—the demand is so slight.

Hon. Mr. DANIEL: That is, they make much more profit?

Mr. BANKS: Yes, on white bread.

As an instance of the fact that the bakers are anxious to supply this bread, if called upon to do so, I may mention the case of one in Montreal who bakes a batch of 100 loaves to the special requirement of a single customer, and do as he will he cannot induce other customers to follow suit, and aid in increasing its popularity.

Flour Extraction.

On page 4 it is suggested that only 62 per cent of flour is extracted from the wheat; and in consequence, cattle breeders prefer the offals from the roller mill rather than that from the stone mill.

Now, the percentage of extraction from wheat must necessarily vary with the quality, and is largely influenced by its weight per measured bushel. With a normal crop of plump, well matured, dry wheat the extraction from Manitoba No. 2 Northern wheat would be about 74 per cent (4 bus. and 25 lbs per bbl.). It is usually divided into two or more grades, but the purchaser may have the whole of it, if he so desires—he gets just what he requires.

The stones of the old-time stone mill, or the flat iron discs of the mill so extolled by Dr. Nadreau have no special virtue in the milling of flour, and what can be accomplished by their aid may be duplicated with equal facility by the roller system.

For certain purposes, no doubt, breeders of cattle would prefer offals from a roller mill, for if the wheat cleaning and milling systems are good it would be cleaner, both in respect to freedom from dirt and weed seeds and also a lower content of flour than if made under the old-time stones.

Reduction of Term of Life.

On page 5 the suggestion is made that the average term of life in America has been lowered to the extraordinary period of thirty-nine years as a result of the consumption of what is called dephosphated flour. I have failed to find any well-known or recognized authority for such a statement, and, if possible, I should be pleased to learn its origin, and also why no mention was made of the experience of other countries, and particularly of Europe wherein the roller system was used before its introduction to this country.

On the removal of Gluten.

Again on page 5 a very extraordinary statement is made, viz: "In white bread the gluten is carefully left out, because it is yellow, and would impair the whiteness of the flour." This statement is absolutely contrary to the facts of the case; and, as previously stated, in my experience of twenty-five years analysing many thousands of samples of flour ground from wheat grown in all parts of the world I have never yet found one that did not show more or less gluten.

Hon. Mr. CASGRAIN: What proportion of gluten?

Mr. BANKS: They vary from 8 per cent to 18 per cent or 19 per cent.

Hon. Mr. CASGRAIN: In Canada here, as much as 18 per cent of gluten in flour as it comes out of Ogilvie's?

Mr. BANKS: No, not always, not by any means.

Hon. Mr. CASGRAIN: Is there ever 18 per cent of gluten from Ogilvie's flour?

Mr. BANKS: Yes, I can show you many instances. It depends on the grade. Low grades will contain that percentage; not this year but in previous years. Low grade flour has more nitrogen than the high grade.

Hon. Mr. RICHARDSON: Will low grade wheat also have more gluten than the high grade?

Mr. BANKS: Yes, more gluten estimated as nitrogen.

Hon. Mr. RICHARDSON: If you make the whole wheat flour you sacrifice that?

Mr. BANKS: Yes.

Hon. Mr. RICHARDSON: Would not that low grade wheat carry more gluten?

Mr. BANKS: Usually it does.

Hon. Mr. RICHARDSON: That would be all the more beneficial, would it not?

Mr. BANKS: It would, if quickly consumed; but the gluten from the low grade flour is of low grade quality also. The matter of cleaning the low grade wheat is particularly difficult, especially with regard to the removal of dirt.

Mr. PRICE: Would not some of the highest grade wheat, such as the Durum wheat, carry a larger proportion of gluten and still be inferior?

Mr. BANKS: Yes, Durum wheat is a very good example. I had experience with Durum wheat when in England. It is a difficult wheat to mill, and yields a flour difficult for the baker to handle; but if properly prepared for milling—if it is previously treated under suitable temperature conditions, it can be used almost as well as Manitoba wheat.

Mr. PRICE: As a rule it is cheaper than the other?

Mr. BANKS: It is usually cheaper.

Mr. PRICE: And it would not deteriorate if made as a 67 per cent flour?

Mr. BANKS: Yes.

Mr. PRICE: And still have a larger proportion of gluten?

Mr. BANKS: Yes.

Hon. Mr. RICHARDSON: We could utilize in this country our low grade wheats to advantage, because the market for low grade wheats is very restricted at the present time?

Mr. BANKS: Yes.

Hon. Mr. RICHARDSON: This year we have had no end of difficulty in selling the low grades to Europe because the English exports to-day are not to compare with those of other years. You remember that for May delivery there is a penalty of 40 cents a bushel to the seller. It struck me that with a poor wheat, even a penalty of 40 cents was an excessive penalty. If we could use a 76 per cent flour, doing away with the question of colour largely, and mix in a considerable proportion of our fours and fives in this, we would be able to give the consumer a cheaper flour with the values in it, and would be able to give the producer a little more money for his wheat, and thus help the farmer and also the consumer. Am I astray there?

Mr. BANKS: If you disregard altogether the huge value of keeping quality, I think you are not very far from the mark, but it is a most difficult thing to dissociate such commercial qualities.

Hon. Mr. RICHARDSON: As to keeping quality, do you not find that this low grade wheat has invariably less moisture than the high grade, providing it is clean? It is shrunken and has a smaller berry, and is dried up more in the harvest fields and elsewhere, and hence does not carry the same amount of moisture that the plump kernel does.

Mr. BANKS: Our experience is that the difference between the ordinary straight grades and what are known as tough is small.

Hon. Mr. RICHARDSON: I am not speaking of tough wheat. I am speaking of what we call a special four or a special five, or even a straight four or five.

Mr. BANKS: I mentioned the question of tough, just to indicate that those low grade wheats are very tough.

Hon. Mr. RICHARDSON: This year all the wheats are tough, more or less owing of the harvest coming earlier and the snow getting into the sheaves, and our wheat carrying more moisture than usual, but that it is not normal, it is an accident to the harvest of last year.

Mr. BANKS: That would be still more noticeable in the flour milled from such wheat.

Hon. Mr. RICHARDSON: I have found that low grades of wheat are carrying less moisture than the high grades this year.

Mr. BANKS: Well I have seen quite a lot that have; and I have seen a lot that have not less moisture than the high grades.

Hon. Mr. RICHARDSON: I do not speak about tough wheat being low grade. Tough wheat has a little more moisture than the ordinary class of wheat, which will grade tough No. 1 Northern, tough 2 Northern, and tough 3 Northern, still they are high grade wheats. But the low grade wheat is a wheat that goes under 3 Northern. It is a wheat you cannot tender on contract else you will be penalised to a great extent. I am trying to bring out the point that we could utilise the low grades to advantage if the consumer has cheaper flour, and giving the producer more money for his wheat. At the present time we have probably 10,000,000 or 12,000,000 bushels of low grade wheat in Fort William, while if you went into the market to-day to buy 50,000 bushels of No. 1 Northern you might have to put the price up 10 cents a bushel, because the high grades are so very scarce at the moment, while there is plenty of low grade, I know that to my cost.

Hon. Mr. CASGRAIN: Do you agree to what the senator says, Mr. Banks?

Mr. BANKS: I am doubtful whether it would pan out that way, or what would be the average. As a matter of fact, it is almost a daily experience with us that the grading is of the most erratic kind we ever experienced, and what might be today valuable as, say, No. 4 or No. 5 grade would be utterly worthless on to-morrow's deliveries—although the inspection would indicate the same grade in each delivery.

Hon. Mr. RICHARDSON: That is because the inspection is erratic.

Mr. BANKS: It is on the inspection that we have to work.

Hon. Mr. RICHARDSON: But you can understand that because we have so many different grades this year. You see that we have a special 4, a special 5, even a special 6; there are three new grades of wheat that we have to make. These special wheats were wheats that were rusted, that did not develop; the germ was killed before it filled out.

Mr. BANKS: Well, it is very difficult to give a really satisfactory answer to your question on that account. The inspection is so erratic and deliveries are so very varied that I really would not like to say that it would average quite as you would wish it.

Mr. PRICE: My experience bears out what Senator Richardson says regarding some of those off grade wheats. Dr. Shutt knows that our tests have been running for moisture, and they have been lower when we have used more of those than when we have been using more of No. 1.

Mr. BANKS: We make quite a number of moisture determinations. Off-hand I would not like to say that on the whole there was any appreciable difference, or sufficient to warrant confidence in running on those lines.

Mr. PRICE: I would not want to be compelled to run on them exclusively, because they are an off-grade wheat.

Mr. BANKS: Very frequently one will get them with considerably less moisture. On the other hand, due to erratic inspection, they frequently turn out quite the opposite, and just at the present moment I really would not like to say how they would average. As to the quality of the flour, I am sure those low grades would yield flour of unsatisfactory color and keeping quality.

Hon. Mr. RICHARDSON: I would not propose that flour should be made entirely from those low grades, but a certain percentage of those low grades should be used with the high grades.

Mr. BANKS: Yes, I think that is quite right. The percentage of nutriment, as a rule, is certainly higher in a low grade wheat of a shrunken character. On the other

band, they are more difficult of milling and the loss in cleaning, etc., is naturally considerably higher than in the case of a more robust type.

Hon. Mr. CASGRAIN: That means that a big round berry does not contain so much nutriment of the same weight as a couple of berries dried up, shrivelled up.

Mr. BANKS: In the majority of instances that is true.

Hon. Mr. CASGRAIN: In other words, the less starch the more nutriment you get?

Mr. BANKS: A certain kind of nutriment—the more body-building, the less energizing.

Hon. Mr. CASGRAIN: The less calories?

Mr. BANKS: The less calories. Naturally, some wheats contain more gluten than others, and some parts of the wheat are richer in their gluten content than the remainder of the berry. Again, in certain countries this more glutinous flour may be used for some special purpose, as in the case of the Durum wheat that Mr. Price was speaking of; but even so, it would not leave the remainder devoid of gluten.

As illustrating the general or average composition of flours milled to an extraction of from 72 to 74 per cent from good Canadian northern wheat, I may quote the following data, which I have had ample opportunity to verify:—

	Standard Patent or		
	First Patent. Per cent.	Straight Grade. Per cent.	First Clear. Per cent.
Gluten (dry)	13·0	14·0	15·0
Fat	0·5	1·2	1·5
Carbohydrates	73·1	71·3	70·4
Mineral matter	0·4	0·5	0·6
Moisture	13·0	13·0	12·5

On the Adulteration of Flour.

On page 6, it is stated that, not content with the abstraction of the highly perishable but nutritive gluten, the fat which so easily becomes rancid, and the entire removal of the natural ferments the miller endeavors to kill any final residue of living substances by the direct addition of alum, talcum, boric acid, salicylic acid, gypsum and other ingredients. If the Honourable Mr. Casgrain has a knowledge of anything of the kind I would humbly suggest that in the interest of the public he should give the names of those doing so, or else—in all fairness to the most noble of all industries retract the statement, at least in so far as the mills in his own country are concerned.

For the past six and a half years I have been resident in Canada and almost continuously examining the flour product of both large and small mills, and I have not found a single instance that would afford the least evidence of the existence of such a practice.

Macaroni.

On the same page we are told that gluten, the most valuable ingredient of the wheat, does not go into the flour, but it goes to make macaroni. The only possible way of accomplishing this separation is to wash away the starch. This is done, it is true, at great expense for the purpose of making gluten flour, which is used by those who are unfortunately afflicted with diabetes. The starch is recovered; but it is totally unfit for baking purposes, and it is never used as flour.

Hon. Mr. CASGRAIN: What is it used for?

Mr. BANKS: Starch-making purposes, sizing purposes in the textile industries, and so on.

The manufacture of gluten flour is infinitesimal in comparison with that of ordinary flour, and the demand is so small that none is made in Canada. Its value

wholesale is about 35 cents per pound, and therefore quite beyond the reach of the manufacturer of macaroni whose products sell for 11½ cents to 19½ cents per pound wholesale.

Hon. Mr. CASGRAIN: Is there not more gluten in macaroni than bread?

Mr. BANKS: No.

Hon. Mr. CASGRAIN: No more gluten in that?

Mr. BANKS: There is in this respect, that macaroni is dry, while bread is considerably damp. That is a question again of dampness percentage.

Mr. PRICE: Macaroni carries more gluten; you could not make it out of our Ontario wheat.

Mr. BANKS: We sell very large quantities of flour of all grades to make into macaroni and in all cases the deliveries are of same regular grades supplied to bakers for bread-making. There are some macaroni makers even who use a percentage of Ontario flour along with ordinary Canadian wheat.

Hon. Mr. DANIEL: As a matter of fact, would flour rise if there was no gluten in it?

Mr. BANKS: No, sir, it would not.

Hon. Mr. RICHARDSON: You say there is no gluten flour made in Canada?

Mr. BANKS: As far as I am aware, there is none made. I have been pushing inquiries a little, not only with respect to this particular matter, but also with reference to one or two people who are anxious to obtain such, and the wholesale distributors and druggist sundry people tell me that it all comes from the States. I really believe that, as a matter of fact, the greater part is made from maize, and not from wheat.

Hon. Mr. RICHARDSON: I do not think you are right. I supply a miller in Watertown, New York, and for years he has been willing to pay the duty on Canada wheat so as to have this for his gluten flour, of which he makes a specialty. He sells it all over, England and in one place or another. The name of the firm is Farewell & Rice, Watertown, New York.

Mr. BANKS: I heard of two firms making gluten flour from wheat flour; that is, washing out the starch in order to obtain a glutinous product; but I could only hear of two, and they were both in the United States. Why there should be none in Canada I do not know.

The CHAIRMAN: I bought gluten flour from London, Ontario, three years ago; that is, it had that on the package:

Mr. BANKS: That is a very different thing.

The CHAIRMAN: Of course, the best gluten flour comes from Battle Creek, Michigan.

Hon. Mr. DANIEL: I do not think you can get any of what is called diabetic bread flour manufactured in Canada. All that I know of is imported.

Mr. BANKS: There are a lot of products on the market masquerading as gluten flour that are really nothing more nor less than selected low-grade streams or portions of the ordinary mill run. In reality they are not true gluten flour. The Government bulletin gives gluten flour as made from flour by the removal of starch and containing not less than 5.6 per cent of nitrogen, not more than 10 per cent of moisture, and not more than 50 per cent of starch. Nevertheless there are a number of products on the market being sold as gluten flour, containing considerably less gluten than named in this bulletin—simply strong types of flour with high gluten content, withdrawn from the ordinary mill separations.

The CHAIRMAN: What do they mean when they put on the package "20 per cent gluten flour" and "40 per cent gluten"?

Mr. BANKS: That is the percentage of gluten in the product. As far as I can gather, 40 per cent is the highest obtainable.

The CHAIRMAN: Yes, that costs 65 cents a package.

Mr. BANKS: Yes, something like that. Again, on the same page, the suggestion is made that millers supply some valuable ingredients of the wheat berry for the making of proprietary foodstuffs such as grape nuts and other similar products. As far as my experience or knowledge goes none of these is made in Canada, and I know of no mills in Canada supplying anything for their manufacture. Graham flour is not a proprietary article; it is defined by the Department of Inland Revenue, Memon., G. 932 par. 5 Graham flour is unbolted wheat meal.

Excess Moisture in Bread.

On pages 6 and 7 reference is made to a certain trick of bakers to add an unnatural quantity of moisture—18 per cent above the alleged normal. But what is the normal amount of moisture in bread? It is distinctly a variable quantity, and is largely dependent upon the type of bread and the nature of the fermentation to which it was subjected before being baked. What are known as short straight dough processes, such as are common in the United States, yield bread of higher moisture-content than the longer system of straight doughs, the overnight sponge and dough and the lengthy potato ferment system of fermentation which prevail throughout Canada.

I have had an extended and intimate experience of the methods used by the bakers of this country, and I have probably examined more bread and baking methods than anyone else during my experience of six and a half years in Canada. As a result, and in justice to the bakers, I must emphasize the fact that I have never found any evidence in support of the honourable gentleman's statement, which I can only regard as grossly misleading and unjustified.

Hon. Mr. CASGRAIN: You do not say how much water there is in the bread.

Mr. BANKS: It is about thirty, thirty-three or thirty-five per cent.

Hon. Mr. CASGRAIN: As much as that? Thirty-three per cent of water in bread?

Mr. BANKS: Yes.

Hon. Mr. CASGRAIN: And how much water is there in flour?

Mr. BANKS: That again is variable; it would average 13 per cent.

Hon. Mr. CASGRAIN: To get the 33 per cent in the bread, they add 20 per cent of water?

Mr. BANKS: Considerably more than that. As a matter of fact, 20 per cent of water would make a mess of it; no man or machine could handle it. It is necessary to use a considerable addition of water in the dough.

Hon. Mr. DANIEL: In order to knead it.

Mr. BANKS: In order to knead it. It varies, of course, according to the character of the flour, from fifty-seven to sixty-four per cent.

Hon. Mr. CASGRAIN: I do not speak of the water added before, but when the bread is being sold to the consumer—the ordinary bread. You say it varies from fifty-seven to sixty-four per cent, but after the bread is baked, say six hours, or twelve hours, what is the percentage of water in it?

Mr. BANKS: It runs down to about thirty per cent after 18 hours.

Hon. Mr. RICHARDSON: Will not a barrel of patent make 280 pounds of bread?

Mr. BANKS: Yes, sometimes more.

Hon. Mr. RICHARDSON: That is more than thirty per cent—that is forty per cent.

Mr. BANKS: Well, that is when it is weighed fresh. A little over 40 per cent. based upon the flour, but 30 per cent. only in the baked product.

Hon. Mr. RICHARDSON: That is what the baker delivers to the customer?

Mr. BANKS: Sometimes it will yield that much; but then there are other ingredients—malt, lard, or oil——

Hon. Mr. CASGRAIN: They put oil in the bread?

Mr. BANKS: Yes.

Hon. Mr. CASGRAIN: What kind? Coal oil?

Mr. BANKS: I have not heard of the use of coal oil. Cottonseed oil, various kinds of pressed fat. Some bakers really do use the best lard they can buy; and milk, both liquid and dried milk, is also used; sugar of all kinds——

Hon. Mr. CASGRAIN: Salt.

Mr. BANKS: Salt, naturally; malt, either as an extract or as malt flour. I believe that in the United States they are now going so far as to introduce various extracts of fruit to add to the variety of flavour. There are quite a number of additions; also the effect of the process of fermentation is very considerable on the yield of bread and the amount of moisture it will contain. In some processes a very large loss takes place, and in others it is much less. Then again, the size of the loaf, and the temperature of the oven have quite a bit to do with the percentage of moisture in the bread.

Hon. Mr. CASGRAIN: If it bakes quickly it leaves more moisture, because a crust is formed and the moisture cannot evaporate so easily.

Mr. BANKS: That is true.

Hon. Mr. RICHARDSON: Are not potatoes also used when they are cheaper?

Mr. BANKS: With the exception of specially prepared potato flours, which are distinctly expensive, I am not aware of potatoes being used in any other case than for what is known as making a ferment. That is a means of increasing the yeast supply.

Adulterated Bread.

With further reference to the dark ways and evil doings of the baker, we are told on page seven that when the flour is so poor in gluten that they cannot possibly use it— and, I would remind you, honourable gentlemen, that we have already been told that the gluten is always carefully removed because of its perishable nature and yellow colouring properties—when the flour is, therefore, deficient in gluten strength, the baker adds bean flour, because bean flour contains a good proportion of gluten; and to neutralize or destroy the dark colour produced by this addition, resort is had to the use of gypsum, which is nothing but ground stone. This is put in and it makes the flour white and heavy; so it is profitable in both ways.

I have never heard of the use of bean flour by the bakers in Canada, but if used for the purpose named there would be no injury to anyone—rather the reverse. On the other hand, if there is a vestige of truth in the statement that either a miller or a baker is making an addition of gypsum to his flour or bread, the fact should be made public, and if the law as constituted does not permit of criminal action being taken, I suggest that it should be amended so as to permit of such being done.

Expression of Food Values.

In discussing relative food values it is somewhat incumbent upon one to follow the orthodox system of assigning the calorific or energy-giving values to the various products. I confess I am not greatly enamoured of the principle. My sympathies and belief incline to the modern teachings of bio-chemistry wherein such phenomena as ionization—that is another term, we will say, for electrical charge, colloidal conditions and activity, and that very vague, but very important, factor known as

"personal equation", take the lead. I believe with Dr. M. S. Pembrey, lecturer on Physiology at Guy's Hospital, London, England, who said that "the idea that a man should determine his diet by its chemical composition or caloric value is not only repugnant, but also unscientific—the personal equation is the primary factor."

Still these modern views do not enable us to assign definite values in the manner afforded by the caloric qualities. In discussing golf we use a special phraseology; so with baseball, with politics, music and science. Each branch makes use of or coins a series of special methods of expression: We do not determine the separate carbohydrates, or differentiate between the very varied types of protein. We regard them as a whole and estimate them as total carbohydrates, or total protein, and determine their caloric values. The conditions with respect to the ferments are even more complex, as owing to their peculiar physical condition they cannot be separated and purified without undergoing profound changes. Their qualities are judged on the basis of their speed or rate of activity under standard, but nevertheless arbitrary, methods of examination.

Hence, whilst one cannot avoid a sense of reverence for the teachings of the modern school, one cannot help deploring its vagueness, its lack of definiteness, its inability to express in calculable quantities the nourishing qualities of the foods we are called upon to employ with efficiency and economy.

Whether viewed from a caloric point of view, or on the basis of "personal equation," one cannot but admit that never was there a gastronomical research so vast and so full of lessons of vital and economic importance as that afforded by the feeding of the eleven millions of people in Belgium and northern France during the present war. It is stated that in "certain sections, notably Antwerp and Brussels and vicinity, the people emphatically protested against grey bread, and the quality of their flour was maintained on a basis of about 75 per cent. In other sections the protagonists of the whole wheat fallacy had their way, for a time, and 85 to 90 per cent flour was the rule, although the people wisely protested."

But "last autumn there was a rude awakening from the theory that bread made from whole wheat flour is, for many people, more healthful than white bread." The teachings of the research schools, which I have endeavoured to outline, had been completely ignored, and as a result it was made necessary to institute a medical commission to inquire into the alarming condition of the public health. It was discovered that the children—naturally the first to feel the effects of the diet—were suffering from rickets, tuberculosis, and childish diseases. The authorities pronounced the condition due to malnutrition resultant from an unsatisfying, unnourishing ration, and it is now costing the Commission for Relief in Belgium \$1,250,000 a month to repair the damage caused by a diet of "grey bread," and to save the children by feeding them an extra, specially prepared ration, abounding in necessary nutrient.

I am therefore forced to the conclusion that independent scientific research as well as the recent and wide experience of food control officials in Europe proves that the milling of whole wheat flour, or even 81 to 82 per cent straight grade, would yield a product that pound for pound is distinctly less nourishing than that of ordinary white flour; that, being much less clean, defects in its preparation would be difficult of detection; that its keeping quality could not be ensured, and that the withdrawal from the market of the valuable animal food which these wheat offals constitute, and which are of but little value either chemically or physically to human beings, would entail a huge economic wastage that is all too apt to be overlooked by those who become hysterically enthusiastic upon the mere mention of whole wheat bread.

I have also brought with me three copies of the paper of Dr. Snyder, to which I referred:—

HOW CAN THE BAKER BEST SERVE HIS COUNTRY?

Statement prepared by Request for Bakers' Conference, Chicago, May 17 and 18, 1917.

By Harry Snyder.

"You have asked me to come here to-day to advise with you in regard to our national bread supply. From what I see and hear, bakers are among our best patriots, and they are willing and anxious to make the cheapest, most wholesome and best bread that can be made. You are gathered here to take counsel among yourselves as to how you can co-operate and best serve your country.

"First, we need to know what materials and how much of them we have for bread-making purposes, and then we must decide the best way to use these materials. We do not know at this time what our wheat crop will be. Much of it has but recently been seeded, and some is even now being seeded. The crop promises to be ample for our own needs, but not as large as we would like for our allies. We are, however, figuratively and literally, prepared to share our loaf.

Among the suggestions that have been made for relief of the bread situation are: (1) Grinding more of the wheat kernel into flour and less into feed; (2) making a more extensive use of other cereals for bread-making; (3) elimination of waste in use of flour and bread. Drastic punishment should follow any attempt to adulterate flour or bread or create conditions to make unreasonable profits.

Making Grey or 82 per cent Flour instead of White Flour.

The advocates of grey bread argue that by the addition of 7 to 8 per cent of the present mill by-products of wheat to their flour the wheat crop and flour supply would be made to go that much farther. The theory that grey bread will relieve the situation is based upon the assumption that pound for pound it is equal in food value to white bread and that the present uses of the wheat by-products give little or no return as human food.

"Fortunately, extensive tests have been made by our own and other governments as to what is the value of wheat bran and other by-products when they form a part of the bread. These tests have extended over a number of years, and they have been repeated and verified by a number of chemists specially designated and employed by the Government to make the tests, and the results have been checked by the nutrition experts of the United States Department of Agriculture.

"Without entering into scientific discussion of the subject, the results of these extensive tests show that it takes about 106 pounds of flour containing a part of the wheat offal, such as 82 per cent flour would be, to equal in nutritive value 100 pounds of white flour made from the same wheat. This is because the wheat by-products are largely indigestible as human food, the human digestion tract not being able to digest the coarser fibrous particles. Should 82 per cent grey flour replace white flour the consumer will either have to be satisfied with less nourishment from his bread or he will have to eat proportionately more of the grey bread to equal the white in nourishment. According to our Government statistics, 5.2 bushels of wheat, which is our present annual per capita consumption, is equivalent to about 226 pounds of white flour, 72½ per cent extraction. It would require about 241 pounds of grey 82 per cent to furnish the same amount of nourishment.

"This answers the question: 'Which furnishes the most total food so far as its nourishing qualities are concerned, white or grey flour?' It is quite evident that the white, pound for pound, furnishes more nourishment, and so we cannot expect a pound of the grey flour to do the same work in feeding the people as a pound of

white flour made from the same wheat. It is also evident that man makes a very poor return for any wheat by-product which he attempts to use as human food, and at the same time he robs the cow of what she can use and for which she makes to man an abundant return. The fermenting tank of the bovine digestive tract can utilize the part of the wheat which man cannot digest, and returns it with good interest in the form of milk and meat. If man consumes the white flour and a cow consumes the bran and other wheat offal, over 90 per cent of the total energy of the wheat is thus utilized jointly. If, however, man consumes 82 per cent flour and a cow gets the restricted wheat offal from this flour, only about 84 per cent of the energy of the wheat is secured. The same relative amounts of available protein are utilized.

Only the Bulk Increased.

"The assumption that the wheat flour supply can be increased 8 to 10 per cent by making 82 per cent flour means simply that the total bulk of flour would be increased, but its nourishing qualities would not be increased and there would be an actual loss of valuable milk, meat and egg producing foods due to any attempt to use wheat by-products as human foods. Healthwise, also, it would not be advisable for every one to consume 82 per cent flour, although some might be benefited because of its laxative nature. Others might be injuriously affected by its use. If, say—as I have heard the statement made—25 per cent of the people are troubled with constipation, why should the other 75 per cent be required to eat something they do not need? Should every one alike be compelled to use grey bread, it is quite probable that it would cause as much diarrhœa disorders, due to the irritating action of the bran upon sensitive digestion tracts, as the number of cases of constipation it would relieve.

"There are other factors, too, that would have to be considered in dealing with 82 per cent flour. It would not keep so well as the white flour, and its nature is such that it would be more readily infected with bugs and insects than white flour. Also, the fact that it is grey and dark in colour would help conceal any dirt or impurities. Grey is a mixture of black and white.

"In the modern milling of white flour particular attention is given to cleaning of the wheat to remove the dirt. Now, if the miller is to make grey flour, would there be the same incentive to remove this dirt as there is in the making of white flour when if left in would show? There is a very appreciable amount of dirt on even the best of wheat. The dirt collects in the crease of the wheat, on the wheat hairs, and on the waxy surface of the kernel. Great pains are now taken to remove this dirt in making white flour, but when the grey flour is made the miller has no means of knowing when these concealed impurities are removed.

Grey Flour would increase the Cost of Bread to the Poor.

"By the present system of milling patent and clear grades of flour are made, the clears selling for \$1 to \$2 per barrel less than the patent. The clears are extensively used for bread-making in cities and localities where a cheap large loaf is required, as among the foreign-born population that have not yet cultivated a taste or become accustomed to the higher grade flour. The clears make a nutritious, wholesome loaf, less expensive and better bread than would 82 per cent flour.

"If grey flour is made there will be no cheap clears; the patent, the clear and a portion of the wheat by-products will all be combined to form 82 per cent flour. As it is now, a man of sufficient means can get the patent, leaving the less expensive clear for those of less means. When a beef carcass is cut up there are cheap cuts of meat and expensive cuts. The cheap cuts are a great boon to the poor, and the well-to-do can buy the expensive cuts. Now, if the cheap and the expensive cuts of meat and a part of the offal were all ground together to form one product 82 per cent Hamburg steak, the cheap cuts and the expensive cuts as such would be eliminated and every one would be eating the same product, the wealthy paying less and the poorer more.

This would not be a wise or economic measure, as the man who could afford and who desired expensive cuts of meats could not obtain them and the poor would have no nourishing cheap cuts. The same thing is true in the case of the wheat kernel. It is a better economic proposition to cut the wheat kernel into patents and clears instead of mixing patents, clears and wheat offal together to form one product, as 82 per cent flour will, I fear, result in taxing the poor man's loaf.

"A brief consideration of the relative prices of patents, clears and a flour as whole-wheat flour, similar to 82 per cent, makes this point plain. In the May 9 issue of the *Northwestern Miller*, page 401, is given the Rochester market prices of flour delivered at Boston in wood (196 pounds). I have taken these prices, as they appear to be about the only ones including a flour similar to the 82 per cent product, namely whole-wheat flour (not Graham). The prices are as follows:—

"Spring patents, \$14.60 to \$14.90 (average \$14.75).

"Spring clears, \$13.35 to \$13.90 (average \$13.65).

"Entire wheat flour, \$13.90.

"Since it takes 106 pounds of entire wheat, or 82 per cent flour, to equal in nutritive value 100 pounds of white flour, it would take \$14.75 worth of the 82 per cent flour to equal \$13.63 worth of clear, or \$14.75 worth of patent. To this must be added the extra cost of transporting to Boston the 12 pounds or more of added weight of the wheat offal in the grey flour.

"It is argued by some that white flour is deficient in phosphates and that the grey would supply more. The fact is, refined white flour contains five times more phosphates than human milk. The argument that grey flour is preferable to white because it is richer in so-called vitamins is also fallacious. Extensive reliable experiments show that neither an entire grain nor a portion of a grain is, of itself, even when combined with another grain, capable of forming a complete ration. Grey bread is not as near an approach to perfect food as white bread, because it contains less digestible nutrients.

"As I look at the grey flour proposition I can see no gain from its substitution for the white flour. It would not go so far; defects in its manufacture would be covered up; it is not so clean and would not keep so well as white flour. The wheat by-products which it would contain has a very low human food value, but has a very high animal food value, which if converted into milk, meat and eggs would be far more valuable. If fed to stock \$20 per ton of manurial value is secured.

"The fact that other countries have used 82 per cent as a war measure is not necessary a reason for our doing so. Our allies have sent us eminent commissioners to advise us in regard to the mistakes which they have made in the conduct of the war and to help us not to make the same mistakes. Is it not possible they have made mistakes on the bread question? We want to avoid mistakes, particularly any as to our bread, the most vital of all things. I believe farmers, millers and bakers, those who raise the wheat, mill the flour and bake the bread, are among the ones who can offer great help in the proper solution of the bread problem. Why not use their combined knowledge in the solving of this problem? They certainly cannot be accused of lack of patriotism or of selfish motives. In other individual lines those most familiar with the industry have given advice and it would seem that bakers and millers are most competent to give advice in their lines. If 82 per cent flour is not feasible, what can be offered? We certainly must have cheaper food of some kind.

USE OF OTHER CEREALS.

"There has been a large corn acreage planted, and let us hope we shall be blessed with a large crop. A good line of corn breads could be made by the baker. If corn bread is a great deal cheaper than wheat bread it will find a ready sale. Let our allies get acquainted gradually with corn (maize) as a human food, but do not dis-

guise it under the name of mixed flour and then try to deceive both our own people and our allies by letting them believe because it has the name "flour" it is the same thing as the wheat flour with which they are familiar. Let it be used on its own merits as corn (maize), a nutritious, nourishing adult food.

"Indiscriminate mixing of wheat, corn, barley or other flours is not advisable, as it opens the doors to fraudulent practices. It has been proposed to mix with wheat flour cornstarch under the name of corn flour or cornstarch flour, and label the mixture according to the percentage of ingredients present, as wheat flour 82 per cent, corn flour 15 per cent. This at first thought might seem to be all right, but such labeling is deceptive and may cover gross abuses. An actual mixture of 70 per cent of wheat flour and 30 per cent of corn flour could be made, and no microscopist or chemist could tell if the mixture were not 85-15 as labelled. Dr. Howard, microscopist of the United States Department of Agriculture, made it very plain before the Ways and Means Committee last winter that the exact percentage of cornstarch and wheat starch could not be detected in a mixture. A label law would not protect the public. The practice of mixing flours correctly must be controlled under the rigid supervision of the Government. To correctly do this the Government authorities must have access to the books and warehouses of any one who blends flour. The public has a right to know what and how much of any other material is blended with wheat flour.

"It has been proposed to use barley for bread instead of for beer. Barley is a valuable human food, much like wheat in its general composition but not capable of entirely taking the place of wheat. Barley flour could be used in many ways to relieve wheat flour, as barley cakes in place of wheat cakes for the morning meals, barley in crackers, barley for gravies and for breading meats.

"Judging from the trade papers, the English bakers prefer barley to any other cereal for blending with wheat flour. It requires skill and experience to successfully make a barley-containing loaf, but if necessity requires I believe our bakers will gladly make such an emergency loaf and as cheaply and as good as it can be made. As a necessity measure it would be far preferable to 82 per cent flour or a cornstarch wheat flour blend.

Elimination of waste.

"By substituting in the arts other products for flour a saving can be effected. No flour should be used for paste-making that is suitable for human food. Years ago a good deal of low grade flour was used for foundry purposes. I do not know what is the practice to-day, but if any quantities are used it would seem that suitable substitutes could be prepared. Elimination in the bakery trade of the dry or stale bread losses would very appreciably increase the supply of bread.

"A wider and more intelligent use of all foods until wheat production is accelerated will help solve the bread question. More and cheaper potatoes, more oatmeal, more cornmeal, barley flour instead of beer, more beans and peas, cheaper milk—all of these will lessen the demand for flour and in turn lessen its cost. The bread problem is not alone a question of wheat supply, but it is also a question of the supply and quality of all other foods, as 'man does not live by bread alone.'

"Answering Robert M. French's question as to the experimental data in regard to the comparative energy value of white and of 82 per cent or whole-wheat bread, I would refer to bulletins 101, 126 and 156 of the Office of Experiment Stations, United States Department of Agriculture, also the bulletins by Woods and others from the same office, giving the comparative results of the nutritive value of different kinds of bread. A brief summary is given of some of these results in Year Book of Department of Agriculture, 1903, pages 347-361.

"Take, for example, bulletin 101, on page 33, the available heat of combustion of standard patent or straight flour is 3,650, and of entire wheat (82 per cent) is 3,445, per unit. One hundred units of white flour furnish 365,000. It will take as many of grey or whole-wheat units with 344,500 available units to furnish the 365,000 as 365,000/344,500 equals 106 nearly. (This is for Minnesota flour.)

"In bulletin No. 156, page 37, a unit of entire wheat flour shows 3,420 available energy units, the white 3,686; hence $3,686/3,420$ equals 107.7. (This is for Oregon flour.)

"Entire wheat flour 3,485 available energy per unit, and 3,721 available energy per unit for white flour; hence $3,721/3,485$ equals 106.7.

"These three sets of tests as an example show 106 nearly, 107.7 and 106.7 as the comparative energy value of the grey or 82 per cent flour, compared with the white as 100. I think a statement of 106 of the grey being required to equal in energy value 100 of the white is quite conservative.

Hon. Mr. CASGRAIN: You heard, this morning, the statement of Dr. F. T. Shutt, the Dominion Chemist, of the Department of Agriculture? You do not agree with him?

Mr. BANKS: No, not entirely.

Hon. Mr. CASGRAIN: You think he is all wrong as to that 80 per cent?

Mr. BANKS: In some respects, yes.

Hon. Mr. CASGRAIN: You heard also his report of what took place at the Academy of Medicine, the University of Cambridge, and all that? Those authorities are all wrong, in your opinion?

Mr. BANKS: The figures require careful consideration. The report is of recent publication, and I have not had an opportunity to study it.

Hon. Mr. CASGRAIN: They are all wrong, and you are right?

Hon. Mr. DANIEL: Mr. Banks, you expressed the opinion that Dr. Shutt was wrong. He spoke of the greater digestibility of a lower percentage of wheat than what we are calling the whole wheat. Do you disagree with that?

Mr. BANKS: By the whole wheat you mean?—

Hon. Mr. DANIEL: He said that 74 or 75 per cent flour was more digestible than 80 per cent. Do you disagree with that?

Mr. BANKS: Oh, no.

Hon. Mr. DANIEL: You do not entirely disagree with Dr. Shutt?

Mr. BANKS: Up to seventy-three or seventy-four per cent extraction, I do not think there is any very serious difference in the degree of digestibility.

Hon. Mr. DANIEL: You spoke in the latter part of your remarks about the effect of what I think you called "grey bread," did you?

Mr. BANKS: I was simply adopting the phrase given in Dr. Snyder's paper, from which I quoted. In that paper he used the term "grey" bread to distinguish it from ordinary white bread.

Hon. Mr. DANIEL: Does he mean whole wheat bread?

Mr. BANKS: No, eighty-one or eighty-two per cent extraction.

Hon. Mr. DANIEL: You referred to the fact that that had such unfortunate results among children.

Mr. BANKS: Yes, sir.

Hon. Mr. DANIEL: From where did you get that information?

Mr. BANKS: That is Mr. Hoover's account.

Hon. Mr. DANIEL: That was his statement?

Mr. BANKS: That was his statement.

Hon. Mr. DANIEL: That this whole wheat, or eighty per cent wheat flour, had such injurious effects on the children that it had to be discontinued and other means of nourishing the children had to be used?

Mr. BANKS: I am not altogether clear. I rather think they have not discontinued it, but they have supplemented it; they have added to the ration.

Hon. Mr. DANIEL: With regard to the digestibility of these two flours, Dr. Shutt said that that was tested by experiments at Cambridge University. Do you know what kind the experiments were? That is, whether they were simply laboratory experiments, or whether they were experiments on the human body—on the human digestion? Do you know?

Mr. BANKS: I am sorry I do not. I had intended to ask Dr. Shutt, but he left before I had an opportunity to inquire. I have not seen that particular record. I really cannot say.

Hon. Mr. DANIEL: I forgot to ask him, because the question was in my mind, whether these experiments were purely laboratory experiments, or whether they were experiments on the human body.

Mr. BANKS: All those I have quoted have been made on humans, and also verified by laboratory experiments. That is to say, the relation between the two was ascertained.

Hon. Mr. DANIEL: I would have more faith in the human tests than in the laboratory experiments.

Mr. BANKS: Unquestionably.

Hon. Mr. CASGRAIN: Do you think the misery and the sickness of the children in Belgium are due entirely to the bread? Do not you think that if they had had a little milk, and butter, and eggs, like other children, they would have got along a little better?

Mr. BANKS: Certainly.

Hon. Mr. CASGRAIN: But they were living under the conditions of an invaded country. So I think it is a very wrong inference. Do not you think that the miller and the chemist are drawing a pretty long bow when they blame all the sickness in Belgium on the fact the bread is made with eighty-five or ninety per cent wheat, when, as everybody knows, the people in Belgium are starving and have nothing else to eat?

Hon. Mr. RICHARDSON: I understand they have used 100 per cent, the whole of the wheat.

Mr. BANKS: Not 100 per cent, but I think they went to 90 and 95.

Hon. Mr. CASGRAIN: Do you think it is fair to blame it all on the bread, knowing the conditions as you know them?

Mr. BANKS: It is a matter of physical characteristics rather than chemical composition. Inquiry of bakers who have to handle this flour would reveal the fact they have unheard-of trouble in its manipulation—

Hon. Mr. CASGRAIN: But you are getting away from the question of Belgium.

Mr. BANKS: No, sir, I am not wandering in the least. You must know well enough, probably from your own experience, that the character of the cooking of a food, the efficiency of the cooking, say, as to whether it is a properly fermented, properly baked loaf, or whether it is partially fermented, sodden and under-baked, etc., has quite an appreciable effect upon the digestion. Now the difficulties of working the present grade of flour are rather great. Bakers on the whole have not even yet got accustomed to it.

Hon. Mr. CASGRAIN: It requires a little more yeast; it will not rise as well.

Mr. BANKS: Not only that—

Hon. Mr. CASGRAIN: Is not that right?

Mr. BANKS: Yes, but in addition the people in France, Belgium and England are having to use quite a variety of added cereals, maize, rice, oats, barley, beans, etc., and the baker has to switch from the use of an 81 per cent flour containing one kind of addition, on to another 81 per cent flour containing a totally different addition, and is thus never sure of the type of treatment that is required. The result is that the digestibility and nutritive qualities of the bread are materially decreased.

Hon. Mr. CASGRAIN: But there would not be that change if the Government made the regulation requiring the making of 80 per cent flour.

Mr. BANKS: Well, I have seen some 80 per cent flours, they are extremely variable.

Hon. Mr. CASGRAIN: Is not Belgium making 85 per cent flour to-day?

Mr. BANKS: No, sir.

Hon. Mr. RICHARDSON: Would you make 76 per cent?

Mr. BANKS: Yes, sir.

Hon. Mr. CASGRAIN: You have never made the 85 per cent? You do not make 600 barrels a day of 85 per cent?

Mr. BANKS: No, sir, we do not.

Hon. Mr. CASGRAIN: Is there not a kind of bread that you make from special flour, at the request of the doctors?

Mr. BANKS: Yes, but we do not make any quantity worth speaking of.

Hon. Mr. CASGRAIN: But you make some?

Mr. BANKS: Yes.

Hon. Mr. CASGRAIN: 85 per cent?

Mr. BANKS: Yes, but the amount is so small——

Hon. Mr. CASGRAIN: How much would you call small?

Mr. BANKS: I really could not give you the amount.

Hon. Mr. CASGRAIN: It is out of your line.

Mr. BANKS: Yes, as to quantities.

Hon. Mr. CASGRAIN: But you do make some?

Mr. BANKS: Now and again.

Hon. Mr. CASGRAIN: What is that made for?

Mr. BANKS: Usually for those people who have a liking for the nitrogenous type, or glutinous type.

Hon. Mr. CASGRAIN: It is not a fact that that is made specially under medical advice—that some doctors tell people suffering from indigestion, and so on, that they must use it?

Mr. BANKS: Yes, we have had cases of that sort.

Hon. Mr. CASGRAIN: And you make it?

Mr. BANKS: I do not know that it is always made for the same person.

Hon. Mr. CASGRAIN: No, because those who use it get better.

Hon. Mr. WATSON: Do you manufacture that 85 per cent flour for export?

Mr. BANKS: Not for export.

Hon. Mr. WATSON: Do you think it would keep for export?

Mr. BANKS: I am sure it would not.

Hon. Mr. CASGRAIN: How long would it keep, Mr. Banks, under the very best conditions—in a dry, cool place. How long would it keep?

Mr. BANKS: That is a bit of a poser. It is very difficult to say, sir.

Hon. Mr. CASGRAIN: But that is your business.

Mr. BANKS: You would imagine so. In reality, you are speaking, I take it, of the present time, and as I have already mentioned, inspection of wheat is so atrociously bad that it is a most difficult thing to say how long a grade will keep when you once get over the 72 per cent.

Hon. Mr. CASGRAIN: Surely you must have some idea. You are chemist of the Ogilvie Company.

Mr. BANKS: With 85 per cent I would not like to rely——

Hon. Mr. CASGRAIN: Under the very best conditions, in a dry, cool place?

Mr. BANKS: I would not like to rely upon it keeping more than a month, if it would do that.

Hon. Mr. CASGRAIN: How is it that 40 years ago it used to keep from one crop to the other, in this country?

Mr. BANKS: I do not think it did.

Hon. Mr. CASGRAIN: What do you think the people ate in the spring?

Mr. BANKS: I think it is just a question of the greater fastidiousness and higher education of modern times, that we are more particular now than people were in days gone by. There has been in the last five or six years quite an improvement, or, at any rate—

Hon. Mr. DANIEL: Quite a change.

Mr. BANKS: Quite a change in the critical attitude of Quebec province in regard to bread. When I came over here six and a half years back, they did not complain of anything like the same trivialities that they will complain of to-day.

Hon. Mr. CASGRAIN: There were many small mills in Quebec at that time.

Mr. BANKS: I do not think there were, six and a half years ago.

Hon. Mr. CASGRAIN: Yes, and there are some now, too.

Mr. BANKS: There are some.

Hon. Mr. CASGRAIN: But the people prefer white flour. The preference for flour is the popular illusion. People do not think the 76 per cent is good because it is not so white. Is not that so? Is not that the popular fallacy?

Mr. BANKS: No, it is not.

Hon. Mr. CASGRAIN: You will not admit that.

Mr. BANKS: In the paper brought before the Bakers' Conference in Chicago by Professor Snyder a very useful suggestion was made.

Hon. Mr. CASGRAIN: Will you leave that report with us.

Mr. BANKS: Yes. The point that I wish to mention is that while Professor Snyder was apparently, and I think rightly, agreeable to an increased percentage of extraction of wheat, he would prefer to have it divided into at least two grades. He contrasts in case of wheat with that of meat. He says that animals are slaughtered and divided into various grades. Persons whose tastes run in the direction of the choice cuts, and whose pockets are deep enough, will buy them; the poorer people get equally nutritious but cheaper cuts. Professor Snyder argues that if the butchers were asked to make a 100 per cent Hamburg steak, the man who preferred the choice cut would have to pay proportionately less, and the poor people would be charged more. In other words, you would be increasing the price of bread to the poor people.

The same argument is applicable to flour.

Hon. Mr. CASGRAIN: In Quebec we used to have two kinds of bread—the *le pain gris*, or grey bread, and *le pain blanc*, or white bread. We got six pounds of the grey bread for the price of four pounds of white bread. All the large families of limited means would take the six-pound loaf, and they would use the white bread only as a sort of relish. That is what you propose?

Mr. BANKS: Yes. We now have quite a long series of grades of flour, and bakers make far too many types of bread.

Hon. Mr. WATSON: What percentage do you take off straight grade?

Mr. BANKS: From 72 to 74 per cent.

Hon. Mr. WATSON: If you make a patent and a low grade how much do you take off?

Mr. BANKS: That is variable, too; but say around 40 per cent patent grade.

Hon. Mr. WATSON: How much low grade?

Mr. BANKS: From about five to six.

Hon. Mr. WATSON: Would the low grades on the patents be greater or less than the straight grades or the same?

Mr. BANKS: The low grade remains practically constant.

Hon. Mr. WATSON: If you are making a high grade patent flour and a low grade at the one milling, or making a straight grade, would your patent or low grade be more or less than your straight grade in pounds?

Mr. BANKS: Even in making two grades, it would only be a lower grade; not a low grade.

Hon. Mr. WATSON: If you are making a patent and a low grade?

Mr. BANKS: It depends upon how far down you go.

Hon. Mr. WATSON: You have a patent and a low grade, and you are making a straight grade; would you have the same number of pounds?

Mr. BANKS: We do not at present.

Hon. Mr. WATSON: Which would you have the most of?

Mr. BANKS: The straight grade, because almost invariably, as far as I am aware, on this side, and I know it is so in England, the percentage of low grade is pretty uniform.

Hon. Mr. WATSON: When you are milling you are running a straight grade; everything runs into the one grade; then you are making patents and a low grade.

Mr. BANKS: We never do. Probably some millers may be running along those lines, but even with our so-called low grade flour there is always a percentage of lower grade, or feed-flour, taken off. Straight grade is the entire flour with the exception of a small percentage of the low grade.

Hon. Mr. WATSON: With the patent and the low grade which you are making at the same time, what percentage do you get out of a bushel compared with the low grade?

Mr. BANKS: Just the same percentage.

Hon. Mr. RICHARDSON: That would be a first, second and third patent, and what is left would be the low grade.

Mr. BANKS: Strictly speaking, it is not first, second and third patent. It is a first patent, or in case of a straight grade, it would be standard patent, and the other grade would be first clear.

Hon. Mr. CASGRAIN: What are grape nuts made of?

Mr. BANKS: I have not had anything to do with grape nuts. I have my own ideas on the subject.

Hon. Mr. CASGRAIN: And you don't know about Nestle's Food either?

Mr. BANKS: No, sir.

Hon. Mr. DANIEL: Do you make oatmeal?

Mr. BANKS: Yes, sir.

Hon. Mr. DANIEL: How does the food value of oatmeal compare with flour?

Mr. BANKS: I think oatmeal is rather better pound for pound. I am afraid I cannot give you figures on that question.

Hon. Mr. CASGRAIN: It is double in protein, but not in calories.

Prof. R. HARCOURT, of the Ontario Agricultural College, was called as a witness, and testified as follows:—

Prof. HARCOURT: Mr. Chairman and gentlemen, yesterday morning I received a summons to come here, I had not read the speech which is under discussion to-day,

so that I would rather not take up that side of the question, as it has already been covered very fully.

It seems to me that one of the objects of this discussion is to see if we cannot devise some means of making a greater use of the wheat of this country for human food. One point on which we should have a clear understanding is the meaning of the term "Whole wheat flour". As the term is used in the trade it means a grade of flour coming from the mill—not necessarily an 80 or 85 per cent flour, yet, there is the idea in the minds of many people that it is the whole of the wheat ground up, and that the term is used synonymously with "Graham flour", when, in reality, they are two entirely different things. The length of extraction has been dealt with by various witnesses, and I think the point is well established, in all experimental work carried out along this line, that as the extraction is lengthened the digestibility of the product is decreased.

Mr. PRICE: Beginning where, and ending where?

Prof. HARCOURT: I would say after you get over 72 or 75 per cent. Above that the digestibility of the product would decrease with the lengthening of the extraction, through the introduction of the bran and the influence of the bran on the peristaltic action.

Hon. Mr. CASGRAIN: Is not that a good thing?

Prof. HARCOURT: It is good for some people, and it may be bad for others; therefore a doctor may recommend whole wheat flour for one of his patients for whom it is an aid, but for another person it might be the worst thing that he could do. For this reason, I think there would be a lack of uniformity in the results obtained from a long extraction flour.

Hon. Mr. CASGRAIN: Is it not true that these little particles of bran cut up this mass of starch and give the gastric juices a better opportunity of working?

Prof. HARCOURT: That is true.

Hon. Mr. CASGRAIN: That is what we claim.

Professor HARCOURT: The bran particles cut the gluten, and the bread does not rise.

Hon. Mr. CASGRAIN: That is in the manufacture of the bread.

Professor HARCOURT: Yes. The result is that you get a soggy loaf that will not digest as well as a well risen loaf. I would like to submit at this time the finding of the St. Bartholomew Hospital in London, England, on this point:—

"From the experiments we are justified in concluding that the higher nutritive value which we might, upon pure chemical grounds, ascribe to grown bread, cannot, with the single exception of fats and mineral constituents, be maintained from the physiological side. On the other hand, distinctly less nutritive materials actually get into the blood in the case of the brown than of the white bread.

"White bread is, weight for weight, more nutritious than brown. Therefore, it appears the preference given by operators in large towns for white bread has to a certain extent a sound physiological basis.

"In the case of people with irritable intestines white bread is to be preferred to brown.

"In the case of people with sluggish intestines brown bread is preferable to white, as it tends to maintain regular peristaltic action and ensure regular evacuation of the bowels, with all its attendant advantages.

"In cases where the proportion of mineral ingredients, and especially of lime salts, in other articles of food or drink is insufficient, brown bread is preferable to white.

"If the dietary is insufficient in fat, or if the patient is unable to readily digest fat in other forms, brown bread may possibly be preferable to white."

Mr. PRICE: That is Graham bread.

Professor HARCOURT: That is Graham bread, and of course the longer the extraction of flour the nearer the bread will be like Graham bread. I do not know that there is any need for me to go over the experiments that have been referred to which prove that the increase of fibre decreases digestibility. In our recent work we have not experimented with flour of a longer extraction than 76 per cent; but, basing my opinion on our general experimental work, I think that it is doubtful if we can use very much more than 76 per cent of the wheat in the manufacture of flour without introducing factors which would be detrimental if this flour was the only flour consumed by the general public. By 76 per cent I mean 76 per cent as an average of all grades of wheat; which may mean as much as eighty per cent extraction of the highest grades. I further recommend that it all be left in one grade of flour. Our department has done considerable work along the lines of making bread from flour made from other grains than wheat, with the idea that the wheat crop is going to be short, and that we must, as the Food Controller states, make up some 160,000,000 bushels, which it is estimated the crop will be short. The question we studied was: can we replace wheat in making bread by using flour from other grains? As I say, we have done considerable work along these lines. We have baked flour of 76 per cent extraction from the wheat, mixed with 5, 10, and 15 per cent of flour, made from oats, barley, rye, rice, corn, and beans, and we find that we can introduce 5 per cent and even 20 per cent of flour made from any of these grains I have mentioned with fairly good results.

Hon. Mr. RICHARDSON: Do you start with a straight rye flour?

Professor HARCOURT: No. We have not made bakings with a straight rye flour. If flours manufactured from other grains are to be used in bread-making, it should be introduced by the bakers, and not the millers. The millers should supply the wheat flour and the flour from the other grains, and if necessary regulations should be made that the baker should use certain proportions of the other kinds of flour. In that case he could change his manipulation to suit the nature of the materials that he would have.

Hon. Mr. CASGRAIN: Corn is not as expensive as wheat. It would be economical.

Professor HARCOURT: I have photographs of bread made from different proportions of these flours. The loaf shown on the extreme left is made from 76 per cent extraction of wheat. The others show, from right to left, the introduction of flour manufactured from each of the other grains to the extent of 5 per cent, 10 per cent, 15 per cent, and 20 per cent.

(Photographs submitted to members of Committee.)

Even if the other grains were equally as expensive as wheat, their introduction into bread making would save a large quantity of wheat for other purposes. Of course the size and texture of the loaf is influenced by the introduction of these flours, and the quality of the bread as measured by colour, texture, or general appearance, loses in proportion to the introduction of these flours. I am sorry that I have not loaves here. I had loaves in Ottawa on Tuesday, made from 76 per cent extract of wheat with 20 per cent of oats, barley, rye and corn, but they were left with the food controller.

Hon. Mr. DANIEL: The weights of the loaves are not given.

Professor HARCOURT: The results of the judging of the bread are given in the following table. In all the tests exactly the same weight of flour was used for each loaf of bread and every care was taken to give each dough a chance to "work" out to the best advantage. A mixture of 5, 10, 15 and 20 per cent of the flour from each of the grains was made with a 76 per cent extraction of wheat flour. The results of the tests are given in the following table:—

TABLE showing the results of Baking Tests with varying mixtures of the flour from several grains with 76 per cent extraction wheat flour.

Name.	Weight, grams.	Volume, c.c.	Quality of Bread.			
			Colour.	Texture.	Appearance.	Average.
1 Manitoba 76%	505	2,590	100·0	100·0	100·0	100·0
2 " 76% + 20% Rye.	513	2,110	100·0	91·0	92·0	94·3
3 " 76% + 15% "	513	2,110	101·0	93·0	94·0	96·0
4 " 76% + 10% "	510	2,330	101·0	95·0	94·0	96·6
5 " 76% + 5% "	512	2,390	101·0	98·0	97·0	98·6
1 Manitoba 76%	515	2,600	100·0	100·0	100·0	100·0
2 " 76% + 20% Corn.	520	1,830	85·0	70·0	70·0	75·0
3 " 76% + 15% "	515	1,970	90·0	80·0	75·0	81·6
4 " 76% + 10% "	514	2,220	94·0	85·0	80·0	86·3
5 " 76% + 5% "	515	2,530	98·0	92·0	90·0	93·3
1 Manitoba 76%	505	2,590	100·0	100·0	100·0	100·0
2 " 76% + 20% Oat	512	1,340	70·0	70·0	60·0	66·6
3 " 76% + 15% "	517	1,970	85·0	75·0	70·0	76·6
4 " 76% + 10% "	516	2,130	90·0	75·0	80·0	81·6
5 " 76% + 5% "	512	2,310	95·0	90·0	90·0	91·6
1 Manitoba 76%	505	2,590	100·0	100·0	100·0	100·0
2 " 76% + 20% Barley	505	2,250	80·0	85·0	95·0	86·6
3 " 76% + 15% "	508	2,360	80·0	85·0	95·0	86·6
4 " 76% + 10% "	507	2,350	90·0	90·0	95·0	91·6
5 " 76% + 5% "	505	2,550	98·0	97·0	98·0	94·3
1 Manitoba 76%	505	2,590	100·0	100·0	100·0	100·0
2 " 76% + 20% Bean	504	1,600	86·0	60·0	60·0	69·0
3 " 76% + 15% "	514	1,790	90·0	70·0	70·0	77·0
4 " 76% + 10% "	516	1,890	94·0	80·0	80·0	85·0
5 " 76% + 5% "	511	2,180	98·0	90·0	90·0	93·0
1 Manitoba 76%	505	2,590	100·0	100·0	100·0	100·0
2 " 76% + 20% Rice	504	1,830	104·0	80·0	70·0	85·0
3 " 76% + 15% "	514	1,980	103·0	80·0	75·0	86·0
4 " 76% + 10% "	516	2,010	102·0	88·0	80·0	90·0
5 " 76% + 5% "	511	2,200	100·0	92·0	85·0	92·0

Hon. Mr. DANIELS: Did you eat any of these loaves? That is the best test?

Professor HARCOURT: Yes, they were all good eating.

Mr. PRICE: White corn?

Professor HARCOURT: Yes, although the loaf shown in this test is made with yellow corn.

Hon. Mr. DANIELS: Does it keep fresh?

Professor HARCOURT: It keeps well. The barley maintains its size well, but it fell off in colour, it was darker. The result of the experiment shows that it would be quite possible to introduce a considerable quantity of either barley or rye, without the consumer ever knowing anything about it. I would not advocate trying to deceive the public. I am just stating the fact that the loaf was so similar in appearance that the difference was hardly discernible.

Hon. Mr. CASGRAIN: What about nutritive values?

Professor HARCOURT: They are very similar.

Hon. Mr. DANIEL: You mark one of these as "war mixture."

Professor HARCOURT: That is because these mixtures are somewhat similar to the British war loaf.

Hon. Mr. DANIEL: They make a darker coloured bread.

Professor HARCOURT: I think that if we are looking for full nourishment from the wheat, we must discard some of our ideas as to colour.

Hon. Mr. DANIEL: How is the food value of the barley mixture as compared with ordinary wheat?

Professor HARCOURT: Barley in itself is similar in composition to wheat so there would be no great difference.

Hon. Mr. RICHARDSON: You can sow barley and have a harvest in August, and the preparation of the land is not so difficult.

Mr. PRICE: Would not the cost of manufacturing barley flour for this mixture be excessive? Take the price of pearl barley to-day.

Professor HARCOURT: This barley flour was made by running the barley through the rollers and sifting out the flour. I do not advocate the process.

Mr. PRICE: That would not do in making a commercial flour.

Professor HARCOURT: Possibly not.

Hon. Mr. DANIEL: Did you bake any bread from wheat flour mixed with oatmeal?

Professor HARCOURT: Yes. It makes a dark loaf, and I am not certain that the fermentation incident to making bread would agree with the oatmeal. I am not sure that it would make a desirable mixture. There are so many other ways of using oatmeal that it is a very doubtful question regarding whether it should be used in this manner.

Hon. Mr. DANIEL: How about rye?

Professor HARCOURT: That made a dark-coloured bread, but not darker than the barley mixture.

Hon. Mr. RICHARDSON: What is the value of rye compared to wheat, as a food?

Professor HARCOURT: It is very similar in composition; if anything, it would be a little stronger.

Mr. BANKS: I should give the rye the preference in that respect, but not for handling purposes. It is most difficult to make bread with.

Professor HARCOURT: I have not got the figures here showing composition, but the composition is very similar to that of wheat, if anything it would be a little richer.

Hon. Mr. RICHARDSON: Many of the nations in Europe use rye flour:—Norway, Sweden, Russia and Germany.

Professor HARCOURT: This was simply an attempt to introduce some of the other flours into bread-making in case there is a wheat shortage.

Hon. Mr. RICHARDSON: Settlers who come to this country from Europe want rye flour. There is a mill in Eganville, up the Ottawa river, that makes a specialty of it.

Mr. BANKS: Dr. Sherman gives rye flour as follows: moisture, 10.77; protein, 12.26. I fancy that he is a little low in the percentage of protein. Fat, 1.58; carbohydrates and starch, 71.42; ash or mineral matter, 1.92; fibre, 2.08. It is very similar to wheat. From the baking point of view I think that there is one feature in connection with rye flour which is worthy of consideration. I think that as far as possible we should select such cereals as are easily used under ordinary normal conditions of baking. We do not know what the coming crop of rye will be like.

Hon. Mr. RICHARDSON: It will be good.

Mr. BANKS: That may mean very bad from the baker's point of view, because all these ferments which Hon. Mr. Casgrain is so interested in are extremely rapid in character, liquifying in character, and they soften the dough and it is difficult to handle, and becomes proportionately indigestible.

Professor HARCOURT: I fancy that we could introduce five or ten per cent without changing the method of baking very much. The bread would be started as a sponge with wheat flour and other cereal flours added when the sponge is made into a dough. I do not think that the changes proposed would very materially alter the nature of the loaf to which the public are accustomed.

Hon. Mr. CASGRAIN: Except in colour.

Professor HARCOURT: It would be off in colour, but it will be off in colour if you make a long extraction. We should get away from the idea that poor colour is associated with poor bread.

Hon. Mr. DANIEL: How would the use of these other flours in connection with wheat flours affect the price of the loaf? People would not use the bread unless there was a financial advantage.

Professor HARCOURT: Well, I suppose the cost to-day is about the same as that of wheat flour. The grain is cheaper, but there is no demand for the flour, and it is not made in quantity. There is no advantage in introducing these flours, if we have enough wheat. The idea is that there is a shortage of wheat.

Hon. Mr. DANIEL: Are there no other ways of saving wheat? I asked one or two questions about oatmeal. If the people could be induced to eat oatmeal they would not need so much bread. Perhaps you can give us the food value of oatmeal as compared with flour and beef. I would like to have it on the record.

Professor HARCOURT: I have a special bulletin published on that subject. I shall be glad to incorporate the essential part of the bulletin in the evidence.

Hon. Mr. DANIEL: I think it would add very much to the value of the report if we could get that information.

Professor HARCOURT: The following is a comparison in the publication to which I refer of the common foods on the basis of what can be purchased for a dollar:

PROTEIN, Fat, Carbohydrates and Fuel Value of One Dollar's Worth of each Food.

	Price.	Protein.	Fat.	Carbohy- drates.	Fuel Value Calories.	Comparative Values.
	\$ cts.	lb.	lb.	lb.		
Rolled Oats.	5 per lb.	2.5	1.36	14.3	36,950	100
Fall Wheat Flour.	4 75 " cwt.	2.0	.20	16.0	34,307	92.8
Spring Wheat Flour.	5 00 " "	3.0	.20	14.3	33,780	91.4
Corn Meal.	5 " lb.	1.31	.25	16.26	33,735	91.3
Farinas.	5 " "	1.9	.20	15.6	33,394	90.4
Rolled Oats (package).	25 for 4 lb.	2.00	1.09	11.5	29,560	80.0
Sugar.	8 00 per cwt.			12.5	23,250	62.9
Rice.	7 " lb.	1.06	.05	11.3	23,210	62.8
Peas.	7 " "	3.00	.19	9.0	23,121	62.6
Farinas (package).	15 for 2 lb.	1.26	.14	10.3	22,207	60.1
White Bread.	16 " 3 "	1.58	.38	9.1	21,650	58.6
Buttermilk.	10 per gallon.	3.0	.50	4.8	17,362	47.0
Skim Milk.	10 " "	3.4	.30	5.1	17,070	46.2
Barley, pearl.	10 " lb.	.84	.10	7.8	16,492	44.6
Beans.	10 " "	1.95	.27	6.0	15,500	42.0
Potatoes.	2 25 per bag.	.87	.04	6.24	13,397	36.2
Malta Vita.	10 " 12 oz.	.74	.10	5.87	12,716	34.4
Toasted Corn Flakes.	10 " 12 "	.42	.11	6.06	12,517	34.0
Grape Nuts.	15 " 17 "	.81	.07	5.56	12,143	33.0
Milk.	8 " qt.	1.04	1.27	1.66	10,402	28.2
Shredded Wheat.	13 " 12 oz.	.66	.05	4.42	9,659	26.1
Beef, flank.	14 " lb.	1.21	1.36		7,970	21.6
Butter.	45 " "		1.88		7,933	21.5
Cheese.	30 " "	.93	1.22	1.4	7,138	19.3
Mutton Chops.	24 " "	.56	1.20		6,106	16.5
Ham, smoked.	28 " "	.51	1.19		5,963	16.1
Beef, sirloin.	25 " "	.66	.65		4,000	10.8
" round steak.	24 " "	.79	.53		3,718	10.6
Lamb, hind quarter.	27 " "	.61	.60		3,672	10.0
Ham, smoked and cooked.	45 " "	.44	.50		2,930	8.0
Salmon, canned.	25 " "	.78	.30		2,716	7.3
Salmon Trout (fresh).	15 " "	.61	.34		2,569	7.0
Cod (salted).	18 " "	1.05	.02		2,307	6.2
Eggs.	48 " doz.	.37	.29		1,912	5.2
Halibut (fresh).	25 " lb.	.61	.18		1,894	5.1

Hon. Mr. DANIEL: Does the term "calories" take in the whole food value, or is it the energy value only?

Professor HARCOURT: Energy value. The proteins are our muscle producing substances. The carbohydrates and fat are the energy and fat producers, and these groups give us energy, so that the energy basis, the heat basis, is the only basis on which we can make a common comparison.

Hon. Mr. DANIEL: It really gives you the food value.

Professor HARCOURT: To a grown person who has only to repair tissue, it makes a good basis for comparison, but for a child who is growing it is not so good. We want to know the amount of protein as well as the amount of heat or energy furnished.

Hon. Mr. DANIEL: Is there any difference in the food value as between the rolled oatmeal and the ordinary oatmeal?

Professor HARCOURT: We carried out a lot of experimental work some years ago in connection with the breakfast foods, and we studied the old granulated oatmeals and the present rolled oatmeals—not only the composition, but we carried out digestion experiments, with college students as subjects, and we found practically no difference between the digestibility of the two. The results were practically identical.

Mr. BANKS: Where differences were shown they were due to the methods of preparation?

Professor HARCOURT: Very much greater difference due to the methods of preparation than to the kind of oatmeal.

Mr. BANKS: This brings home the question I referred to with regard to bread; it depends upon the cooking.

Professor HARCOURT: Yes, that is a strong point. Of course, one baker can spoil a good flour, where another one would make good bread out of poor flour.

Hon. Mr. RICHARDSON: The old fashioned oatmeal of the Highland Scotchman was granular and kiln dried, and therefore the cooking of it was much simpler than that of the rolled oats.

Professor HARCOURT: They are all kiln dried. I think that one point that ought to be emphasized in this work is that the public ought to be encouraged to use oatmeal and cornmeal in the making of porridge, and hoe-cake, and oat-cake, etc., to take the place of our wheats; and possibly educational work along this line might extend their use and release sufficient towards substituting wheat without bringing the flour from other grains into bread making at all. I think there ought to be a good deal of work done in that line.

Hon. Mr. DANIEL: Is there a good deal of difference, for instance, between the food value of cornmeal mush and oatmeal porridge?

Professor HARCOURT: I have not the data here, but cornmeal will not furnish much more than half the amount of digestible protein that we get out of oatmeal. I have this information worked out from our own digestive experiments.

Hon. Mr. DANIEL: I think it would be very good if we could get them.

Mr. BANKS: I have not the digestive values down; I have only the composition.

Professor HARCOURT: Mine are worked out largely from our own work and on the basis of digestibility.

NUMBER of Grams of Digestible Protein, Carbohydrates, and Number of Calories from
10 Cents Worth of the Foods.

Food.	How sold.	Price +	Grams of digestible Proteids.	Grams of digestible Car- bohydrates.	Calories.
		cts.			
Granulated Oatmeal.....	In bulk.....	7 lbs. for 25	118.3	885.1	4,922
Rolled Oats.....	" " " " 25	7 " " 25	127.1	874.1	4,915
" " " " " "	In packages..	2 " " 10	90.9	624.1	3,510
Farinas.....	In bulk.....	6 " " 25	75.9	806.3	3,860
" " " " " "	In packages..	2 " " 15	41.8	448.0	2,146
Wheat Germs.....	In bulk.....	7 " " 25	118.9	950.5	4,861
Rolled Wheat.....	" " " " 25	6 " " 25	73.9	793.4	3,784
" " " " " "	In packages..	2 " 13 oz. 15	57.8	619.8	2,964
Flaked Barley.....	In bulk.....	2 " for 10	59.6	683.1	3,035
Cornmeal.....	" " " " 25	8 " " 25	70.1	1,175.1	5,316
" " " " " "	In packages..	3 " " 10	62.6	1,049.2	4,746
Orange Meat.....	" " " " 15	20 ozs. " 15	26.9	279.3	1,341
Force.....	" " " " 15	16 " " 15	18.0	219.0	1,010
Norka.....	" " " " 15	22 " " 15	48.5	282.7	1,578
White Bread.....	In loaf.....	2½ lbs. " 10	90.4	546.8	2,817
Entire Wheat Bread..	" " " " 10	2½ " " 10	71.5	473.3	2,418
Graham Bread.....	" " " " 10	2½ " " 10	73.7	443.7	2,322

NOTE:—+ Calculations made in 1907.

Mr. BANKS: Cornmeal runs about 8 per cent protein, and oatmeal from 14 to 16; that is from Dr. Sherman on Foods.

Hon. Mr. RICHARDSON: Have you any statistics showing the difference in protein between our American oats and our Western oats?

Professor HARCOURT: No, we have not.

PAUL SCHLICHT, Physicist, Experimental Chemist, Economist, Fellow of the Royal Society of Arts, London, Member of the Franklin Institute, Philadelphia, was called as a witness, and testified as follows:—

Mr. SCHLICHT: I can remember when we all ate natural food. Evidently none of you gentlemen can remember that; you have been living on denatured foods and white bread. I remember that the bread my grandmother baked forty-five years ago tasted very much better than the bread of to-day, and when we went to the United States I would not eat ordinary white bread, but I ate rye bread.

Hon. Mr. DANIEL: A depraved taste.

Mr. SCHLICHT: A natural taste, sir. The food of to-day, the food that has thirty per cent of its vital values treated as offal, is the food of physical degenerates; it is due to this degeneracy that they cannot digest what their fathers digested and grew strong on. The ancient Romans lived on 100 per cent wheat; they fought their battles and conquered the world on the whole wheat grain. They did not require that one-fifth to one-third and that the most valuable portion be separated. They had unspoiled stomachs and healthy intestines. They did not need pills and purgatives. Their tastes were not depraved. (The honourable gentleman's remark regarding rye bread is infelicitous. God's chosen people have that taste). They broke the wheat grains with stones, mixed the meal with water and salt, and baked it in the sun, and they were better physical specimens than those for whom Nature's foods are not good enough. But there were no misapplied Hungarian mills and millionaire millers with their clever chemists to mitigate economic and hygienic iniquities as in our day. The Commonwealth controlled the granaries. There was no profiteering, no necessity to make a hygienically deficient article so it can be stored and speculated in. They lived, it is true, more of an out-of-door life; they lived a natural life. I have a loaf of bread

here that is said to be 85 per cent wheat; I bought it an hour ago in Ottawa. It is made, I was told, with Ogilvie's so-called whole-wheat flour, and I understand that physicians are recommending it for indigestion. I called upon the Ogilvie Milling Company, some three or four months ago and was referred to Mr. Banks, their chemist, with reference to the making of an improved whole-wheat bread, and Mr. Banks produced, according to an experimental formula of mine, a loaf which he humourously designated as ostrich bread; it was six weeks old; I digested it, and enjoyed it. I was ill at the time and had not the digestion of an ostrich. I want to say to you that while I was troubled with nervous indigestion, white flour did not agree with me. I ate whole wheat bread of 100 per cent and its nutrient powers were evidently good because with it I could get along with one-half the food I ordinarily ate. I recommended it to a number of prominent men, whose testimony agreed with mine. In not one single instance did I have a complaint of indigestion from its use.

Hon. Mr. BOURQUE: You do not mean to say that that bread cured you of nervous indigestion?

Mr. SCHLICHT: I do not say that, sir; but during the period that I was ill, I ate only whole wheat bread, and I could digest it.

Mr. BANKS: It was baked on a commercially impracticable system, from the point of view of the ordinary baker of to-day.

Mr. SCHLICHT: In Scotland and in England there are three bakeries that are turning out approximately 20,000 loaves of similar bread a day. I understand that a thousand loaves of this bread daily are sent to British prisoners in Germany, and it is said to keep for sixty days. That is a fact of great financial significance; I have been experimenting to produce such a bread, but have only partially succeeded. The reason, I am told, is that Canadian wheat does not contain the chemical and physical properties that distinguish the particular Scotch wheat from which Veda bread is made nor do the methods of milling that prevail here make feasible the production of this Veda bread, which I like better than all the other breads that I have eaten. It is made in New York to-day, and has quite a large sale; and, while it would cost less than white bread, if made from native grain, it sells for double the price and consumers gladly pay the price. The wheat is imported from Scotland. I understand physicians recommend it.

Mr. PRICE: Is it not the case with a good many of those breakfast foods that they sell for twice the price?

Mr. SCHLICHT: Yes. I know that this particular bread, ounce for ounce, should cost less than ordinary white bread, and because it is a rarity and because of its greater food value a better price is got for it.

Hon. Mr. DANIEL: And because they advertise it.

Mr. SCHLICHT: Yes. In New York it has quite a sale. After having exhausted the present commercial flours, so-called whole wheat, I made milling experiments myself, and Professor A. Stansfield of McGill University, has offered to assist me to experiment with a mill that I am about setting up. I have made bread from 100 per cent wheat, ground in this mill. That bread, although it does not rise readily without the use of a special yeast that I have prepared, is very, very palatable. I have eaten a good deal of it myself, and I have given it to others. So that I am borne out in my contention that not only is an 85 per cent flour bread possible but a 100 per cent. Sir Henry Thompson endorses a 95 per cent wheat flour going further than does Senator Casgrain. Sir Henry Thompson says it is too bad that the requirements of the trade and the fancies of the consumer are such that the minerals, the inert substances, are removed from wheat, because they have a great physiological value; and he gives a great number of instances where tests have been made which show that 95 per cent flour is feasible. Now, here is my idea, 100 men to whom were fed different kinds of foods to see what the effect they would have on their productive energy as miners, were found to exert more energy and do more and better work on pork and beans and

cornmeal—water ground corn meal—bread than on good beefsteaks and white bread. In fact, on their own volition they gave up beefsteak and white bread and went back to natural cornmeal and beans and pork. You gentlemen probably know that before the American Civil War the American slave-owner worked out to a nicety just how many dollars and how many cents it cost to get so much work out of a slave. The principal cost was the cost of the water-ground meal and bacon. He fed them no wheat bread as an ordinary food, the negro had no white bread. He was stronger before the war than he is to-day on modern wheat bread. I say again that if the stomachs of the people to-day cannot stand natural food, natural bread, it is due to the fact that they have physically degenerated. I know for a fact that there are people who must have very fine ground flour, because their mothers used that kind of flour.

Hon. Mr. DANIEL: You do not take account of the fact that many people have sedentary employments, while those that you speak of were at hard manual work out of doors all the time.

Mr. SCHLICHT: All right, now I am going to give you some facts about persons of sedentary employments. Persons in the employ of the Ocean Steamship Company of New York, including the cashier, shipping clerk, assistant to the president, eat the whole wheat flour bread. Their occupations are sedentary; they are in the offices, more hours of the day than persons of sedentary habits here. There is Bermaline loaf, said to be whole wheat made in Montreal which has the mark of Scotland on it; it is baked by Aird. It is prescribed, or advertised for indigestion. It is said to be 85 per cent wheat.

Mr. BANKS: It is licensed by the Scotch owner.

Mr. SCHLICHT: I bought a loaf of this Bermaline whole wheat bread; I am told it is inferior to the Scotch bread of the same name.

Hon. Mr. BOURQUE: By whom made?

Mr. SCHLICHT: By Aird, the baker; so I am a little surprised to hear the professor and others say that whole wheat bread produces indigestion.

Professor HARCOURT: I do not know that I said that. I said that it caused diarrhoea more than indigestion. Whether you are going to take the two as synonymous or not, I do not know.

Mr. SCHLICHT: I understood Professor Harcourt to say that it was indigestion.

Hon. Mr. DANIEL: They stated that it was not as digestible.

Mr. SCHLICHT: Not as digestible and that the children in Belgium were suffering from indigestion in consequence of the higher percentage wheat flour.

Mr. PRICE: Do you emphasize water-ground meal?

Mr. SCHLICHT: I only say water-ground meal because my experience has been with meals not ground according to the Hungarian process in vogue to-day. I do not say that the same thing cannot be done with some other process. I have recommended white Virginia cornmeal, water-ground, because I have had experience with it. I was interested in Senator Casgrain's statement about the stone-mills, because if a corn product was better ground that way why not a wheat product. Where I lived forty-three years ago we took our wheat to the mill where they used stones, and I know that I used to go to the oven when my mother was not there and pull a piece of bread out, it was so tasty, so appetizing.

Hon. Mr. DANIEL: How old were you then?

Mr. SCHLICHT: About thirteen years.

Hon. Mr. DANIEL: Exactly; a 13-year old boy is always hungry.

Mr. SCHLICHT: Sir Henry Thompson says: "The disadvantages of bread as a food are those of flour. It has too little salt and too little fat." Of macaroni, he says: "It is made from the hard wheat from France and Italy." Then he goes on to tell about macaroni made from those hard wheats, it is superior to macaroni made

from the ordinary wheat. (That is why, I suppose, the imported macaroni is higher priced than the native article.) He says: "The large quantity of gluten present in those hard wheats allows the manufacture of macaroni as found in commerce."

I have just adverted to the bread of the working man, and have recommended that it should be made from entire wheat meal, not too coarsely ground. Extreme coarseness in whole wheat meal is a condition to exert a specific effect on the digestion for those who need it; and, useful as it is in its place, it is not desirable for the average population. I say that the average population has been spoiled by the use of white bread. The average population is not so strong to-day as the average population of fifty years ago, and the degeneration of food has a great deal to do with it. Look at the amount of meat you have to eat in order to be fed to-day, compared with fifty years ago, when you had good bread. Sir Henry Thompson says: "No portion of the grain should be removed from the wheat when ground, whether coarsely or finely, into meal. That a partial removal is systematically advocated by some as an improvement is one of the numerous illustrations of the modern and almost universal craze which now exists among food purveyors for eliminating all inert or innutritious matter from the food we eat. This extraordinary care to employ nothing in our diet but matter which has nutritive value, that which can be absorbed into the system, is founded upon want of elementary knowledge of the first principles of digestion."

I am going to prepare and put before your Committee the results of my experiments, because I have made 100 per cent wheat flour into palatable, nutritious, and digestible bread.

Hon. Mr. DANIEL: You go beyond Sir Henry Thompson?

Mr. SCHLICHT: I go beyond him. I do not say that it is good food for everyone, infants for instance. I am not saying that at all. I do not know that all that these gentlemen have said is absolutely correct. I only know that my experience with natural foods has been greater. I am simply giving you my experience. I believe that a certain kind of bread may be injurious to you and good for me. I have come to that conclusion now. But this I do know, that in the South natural white cornmeal is a universal food and everybody including infants can digest it, when water-ground. The steam roller mill process, I am informed, overheats the product and decreases digestibility and nutritive values.

Hon. Mr. DANIEL: It is used universally in the shape of johnny-cake, and that is the way they take it.

Mr. SCHLICHT: They take it in the shape of batter-bread and hoe-cake, and ash-cake and dodgers, and I can say positively that that corn from the South ground in those mills is a food we all can live on.

Hon. Mr. DANIEL: It is very nice. I have been down there and I have eaten it.

Mr. SCHLICHT: All right, you know that. As to whether that would be true of all whole wheat bread or not, I cannot say. I can only speak from my own experience, I personally like rye bread, but prefer the whole Scotch wheat Veda bread, and I have carried on certain experiments to make an equally good bread from Canadian wheat.

Hon. Mr. CASGRAIN: What is that about McGill?

Mr. SCHLICHT: McGill University, through Professor Stansfield, is permitting me to put up a mill in Dr. Stansfield's laboratory, to grind flours from 100 per cent down, in the Chemical building.

Hon. Mr. CASGRAIN: When will they have it ready?

Mr. SCHLICHT: It will be up in a few days, I trust. The French have gone into this thing very thoroughly. I have read a number of French authorities. They bear out everything that Sir Henry Thompson says. The Germans make a 100 per cent wheat bread. They also make what is known as pumpernickel. Mr. Banks may be able to tell us what that is composed of. I do not know.

Mr. BANKS: It is whole wheat.

Mr. SCHLICHT: I know that a great many people eat pumpernickel. I do not like it, but it is the bread of the German peasantry, and it is said that the German peasantry have made such good soldiers because they were fed on nutritive bread. And the Jews have rye bread; they do not want the ordinary bakers' bread to-day and they will not eat it, and I suppose that is why the Jews have such vitality. I have studied the question of the vital value of foods and I know. Take for instance oats. Remove the hull. Feed that oats to the horse, and see how he will behave. I have done that.

Hon. Mr. BOURQUE: He will not chew it as much.

Mr. SCHLICHT: No; but there is a vital principle of very great value, an energising principle, in the hull of the oats as there is in the hull of the wheat grain, that cannot be measured by calories.

Hon. Mr. DANIEL: There is another principle about it. The horse does not always digest it; it goes right through the bowels without digestion.

Mr. SCHLICHT: I am glad you mentioned that, senator, because a physician in New York prescribed whole wheat cakes for persons suffering from indigestion and rheumatism. He made a very great success.

Hon. Mr. DANIEL: And constipation, perhaps.

Mr. SCHLICHT: And constipation. It was the whole wheat simply pounded; it was not ground. Well now, the secret of it was that in order to make food of it you had to chew it. When you chewed it you got all the nutritive values. It was much more digestible than ordinary white bread. He tried to imitate the bread of the Romans. Now I would say this, that it has been proved by independent investigators that the percentage of flour can be raised to 85 per cent with safety, because such bread is prescribed to-day for persons suffering from indigestion. That is a fact, not only here, not only in the United States, but in Europe. Now if you explain that to me by saying, "Those are abnormal cases," I will reply that I have known many people who have lived on whole wheat bread all their lives and won't have anything else, who are strong, healthy, normal persons, capable of doing more work in the open or in the office than the advocates of white bread.

Hon. Mr. DANIEL: Perhaps they cannot get anything else.

Mr. SCHLICHT: Oh, yes, they can, but they go to a very large expense to get the whole wheat bread. People I know buy flour from the Watertown mills. When I went to the Ogilvie mills, I was told by the secretary that they produced about 600 barrels per day, or that they could produce about 600 barrels per day, of whole wheat flour, and that, under certain conditions, 3,600 barrels a day.

Hon. Mr. BOURQUE: They said they could, but possibly they did not know. Do you know if they could?

Mr. SCHLICHT: I do not know that.

I should like you to ask me some questions, because I did not come here with any prepared data.

Hon. Mr. DANIEL: What is your professional business in Montreal, Mr. Schlicht?

Mr. SCHLICHT: I am an engineer, sir.

Hon. Mr. DANIEL: You are an engineer?

Mr. SCHLICHT: And I am interested in collieries and in the economics of labour and food. I am interested in the old Silkstone collieries of South Yorkshire, and on account of the war nothing can be done there, so far as I am concerned. I am a Canadian by birth, but have not been active for many years, but now that I believe that I can be of some service to my native land, I am anxious to contribute whatever knowledge and experience I possess that may subserve its best interests.

Hon. Mr. DANIEL: You are taking it up as an amateur?

Mr. SCHLICHT: I have taken up physiology and hygiene as studies, with a view to doing something practical that may benefit my country. I have delivered many

lectures before scientific bodies, the Sheffield Scientific School of Yale University, the Franklin Institute, Bowdoin College, The Stevens Institute of Technology, the Royal Society of Arts.

Hon. Mr. BOURQUE: On engineering?

Mr. SCHLICHT: No, various subjects. For instance, the physics and chemistry of combustion. I read a paper in Dublin before the Institute of Gas Engineers on "The Financial Significance to the Gas Industry of the Modern By-Product Oven." This had to do with the critical temperatures at which coal distillates can be produced without dissociation losses, and how by-products can be made that more than pay for the cost of the gas. I read a paper before the Royal Society of Arts, of which I am a fellow, on the production of coke and its use in domestic fires. The Gas Light and Coke Company, of London, of which the late Sir Corbet Woddall was Governor, adopted my suggestion for a smokeless fuel, which they call "carbo."

Although I have found that calories are not a measure of human food values, the chemistry of combustion in the human body being somewhat analogous to the subject I have spent a lifetime on, that work has stood me in good stead. I have for thirty years studied the chemistry of foods, and I have studied physiology, and I am at the service of the Canadian Government, free of charge. I have made experiments in the purification of water by means of hydraulically compressed air; to increase the available carbon of lignites; to utilize peat; and in the realm of smokeless combustion. Latterly hygienics and economics have claimed my attention.

The CHAIRMAN: I presume that you will give us the advantage of your experience?

Mr. SCHLICHT: Everything I have and all I know, my country can have.

The bread I am proposing will have, according to the best authorities in Edinburgh and London, seven times the digestibility of ordinary white and six times that of so-called whole wheat bread. The chief argument for white flour, therefore, falls to the ground, also the charge of Mr. Banks that the proposed bread is "manufactured on a commercially impracticable system." Even in that this distinguished chemist is wrong. The Veda bakeries in Edinburgh, London, and Birmingham, according to Robert Graham, President of the Veda Corporation, Fifth avenue, Ray Ridge, New York, are paying, or are capable of paying, over 65 per cent on the net investment. A flour mill is included, which, of course, adds to the profits of a bakery. I am proposing to set up a mill in a modern bakery and prove that such a proposition is economically and financially a feasible one, and a solution of better wheat conversion as well as a boon to the physically weak-stomached who cannot digest, according to General Labelle and Mr. Banks, the bread made from the national flours of England and France.

Your committee shall have the full results of my work, both at McGill and at this modern bakery.

Mr. R. N. PRICE, president of the Empire Flour Mills, Limited, Company, of St. Thomas, Ont., was called as a witness, and testified as follows:—

Mr. PRICE: Gentlemen, I have been very much interested in the discussion, and, I believe, instructed. I scarcely know what is desired of me unless I follow along the line of some of the other witnesses.

Hon. Mr. CASGRAIN: The principal thing is the percentage that we can get out of wheat. That is what we would like to know from you.

Hon. Mr. DANIEL: How wheat flour can be used to the best advantage.

Mr. PRICE: I may preface my remarks, gentlemen, by saying that I am a practical miller, having served my apprenticeship in the old stone system and graduated to the roller system, and at one time passed as an expert for one of the oldest mill-furnishing houses in the United States. So that I can at least claim to understand that end of the business. As a Canadian I am extremely pleased to see the move that has been made by your honourable body in trying to meet the situation by get-

ting a greater amount of digestible food from wheat, or other products that will take the place of wheat. I am very glad that Professor Harcourt made the distinction that he has made. He used part of my material, of what I had in mind, but I could not put it better than he did.

Graham flour takes its name from a Dr. Graham, an American physician of some fifty years ago, who, like our friend here (Mr. Schlicht), advocated the grinding up of everything in the wheat after it had been cleaned, and using that, because not only of its nutritive but also its medicinal properties. Whole wheat flour, in trade parlance, means a wheat flour with the outer bran removed. Some of the mills grind it finer than others. A sample of it is produced here.

Now, it is well to give a reason for the faith that is in you, and if you would permit me just a moment, I would say that I never have Graham bread or Graham flour in our own house. I have experimented for years, putting on the market an infants' food and raising my own family on it, and could show you a pile of testimonials to the effect that I have saved infants' lives, under Providence, by the use of this food; not that I was in the game for the money that was in it; but one mother told another how much good it had done. I say that simply to show that I have been a student of the food values of cereals.

Hon. Mr. CASGRAIN: What did you call that infants' food?

Mr. PRICE: My own infants' food, that was all. The reason that I do not advocate, in fact never use, Graham bread, I cannot make clearer than by describing a grain of wheat somewhat in this way—and I think any analyst will verify me. A grain of wheat is covered by two skins, as is the human body. You have often broken the skin of your hand and it did not bleed; you had only removed the outer skin. There are two coverings to a grain of wheat. That outer skin is wood. I had a friend who invented a machine for the removal of this. It required the use of water, and it came off in the shape of fine excelsior—very fine appearing excelsior. But he had no use for it and he could not afford to lose that weight of grain. He called me into conference and asked if I could suggest anything. I said, "I do not know, unless it would make paper," and the result was that I took samples of it and took them to the analyst of the American Strawboard Company. This was about thirty-five years ago. His first words on examining it were, "How did you get wood in this shape?" I said, "It is not wood." He said, "I will let you know to-morrow or the day after." I met him a few days afterwards and he repeated it: "Why did you tell me that was not wood?" I said, "Absolutely it is not." "Oh, it is," he said; "It stands all the chemical tests of wood fibre." I think any person would require more than we heard to-day to persuade him that it carries nutritive qualities. It will do this to the person who is doing office work; it will set up an irritation of the mucous membranes, and to that extent will assist people who are not doing active work—will give the same results, I think, as would happen if you were to use something in the nature of a laxative; and you would become addicted to the one as much as you would to the other.

But, as I understand your Bill, Senator, you use the term whole wheat in a way which would give a wrong impression to the people who are manufacturing it. What you desire is a flour which would utilize the largest proportion that could be taken out of the wheat after removing the injurious particles. I am in active sympathy with the movement. Just how far you can go, I do not know, but I have gone to 76 and I would be a strong advocate of the passing of an Act prohibiting the manufacture, sale or importation of any flour of a less extraction than 76 per cent during the continuance of the war, and until such time as His Majesty's Government saw fit to remove the restriction. For this reason: We have heard to-day how much flour is produced from a bushel of wheat. That is a variable quantity, according to the quality of the wheat and the condition of the mill—the perfection of the mill and the ability of the miller. But I feel that I can say to you, Mr. Chairman and gentlemen, that the average flour that is used in Canada for human flour does not exceed 42 pounds to the bushel extrac-

tion. I am not saying that there are not fine mills like the Ogilvie that extract more flour than that; but it is not used for human consumption; it is used for calf feed, core flours, and feed flours, dog biscuit, etc., and known as Red Dog, sometimes. The result is that you are losing a certain amount of flour that you might otherwise utilize, if you were ready to offend the aesthetic colour taste, if I might use the expression, of the people, and put that flour with the rest; not indiscriminately, as it comes from the mill, because it would have to be reduced and refined and properly bolted before being added. And then you would not have a brown flour; it would not be a question of colour, it would simply be a question of shade. I feel strongly on this matter. I have a sample with me. There is the sample (indicating), so you can see what the flour looks like in the dry state. As to the bread made from this, I cannot argue with our friend (Mr. Banks), not being an analyst, but I can argue as to the keeping qualities of the flour—only from my own experience, but I know that the bread made from this flour will keep longer and be more palatable at the end of a week than that made from the highest patent made in Canada.

Hon. Mr. DANIEL: 76 per cent?

Mr. PRICE: 76 per cent. And the reason for that is because some of that much-despised germ is in it, and the germ carries the sugar and the essential oil of the berry to a greater extent than any other part of the grain of wheat. The germ is the new plant life. Surrounding that are the properties required to feed the little plant life when it starts. It is more nearly like the mother's milk than anything else I know of. After the little plant has assimilated the sugar, oil, et cetera, it begins to send down its little tendrils into the berry, and feeds,—and finally out into the earth surrounding it. In adding that germ to the flour you have added more sugar. It is treated. You have added more oil. You have heard the statement that bakers add lard and sugar to the flour. You have heard how much of these ingredients per barrel is added to the flour. Here it is already in the wheat. It is retained in the flour, that is, to some extent.

Then you have a problem before you. It has been advocated here to-day that the millers should be permitted to make 76 per cent as some of them claim, or 74 per cent, and divide it into two or three streams. Gentlemen, if you do that, you lose as food the little stream that I am speaking of; you will straightway give the fellow who has the longest pocketbook the privilege of buying the white and making his neighbour envious—"Any Jack is as good as his master now"—and you will not get the result you are trying to get. I would suggest that you fix a standard based on a flour that can be produced from the average wheat, including, as Hon. Mr. Richardson has said, a percentage of the lower grades in proportion to the percentage of low grade wheat that you think will be produced during this year. I would say here, gentlemen, that the season is getting late, and the percentage of lower grades of wheat, or the chances of having more of the lower grades of wheat, are enhanced by probably twenty per cent, because we are at least 15 days late.

Hon. Mr. RICHARDSON: You will always have them.

Mr. PRICE: There is a misnomer in saying 76 per cent extraction without saying from what that 76 per cent shall be extracted. You take a No. 1 northern wheat. We do not say No. 1 hard, 60 pounds and upwards, sometimes 62 pounds to the bushel, and extract the 76 per cent. And you take one, say, of your 5 Special, or 4 wheat, and you extract 76 per cent of that, and you will not get the same flour. Therefore, I would say, if you have a Bill of this kind it would be necessary for you to appoint some board to establish a standard equivalent to what would be produced by the average wheat produced in Canada that season. That might change from season to season. Some millers may say, "Well, have I not the right to make something better than that?" "Would not some other fellow be doing it?" You can get around that difficulty by not permitting him to sell it for any more money than the 76 per cent. Let him make it if he wants to make it. That, it seems to me, would meet the conditions.

Let us go back again to the statement that 42 pounds to the bushel are as much flour as the average mill produces and that reaches the householder. By producing 76 per cent you would add about four pounds to the bushel, or practically 10 per cent. If our annual production runs anywhere from 240,000,000—and some are prophesying 300,000,000—but say 240,000,000 bushels of wheat, that would be equivalent to adding the production of 24,000,000 bushels of wheat to the flour produced in this country. What does that mean? Figure it out. 24,000,000 bushels.

Hon. Mr. RICHARDSON: \$50,000,000.

Mr. PRICE: Figure it out the other way. The population of Canada is, roughly, eight millions. Eight into twenty-four three times,—or the equivalent of three bushels,—one hundred and thirty-eight pounds of flour, or enough to feed all of Canada for six months. So you can see what it means. If you do that you are not injuring any person, you are meeting a condition that is confronting us, and what you gentlemen will effect will put into insignificance the efforts being made by so many of our patriotic societies and good thinking people who are asking us to deny ourselves one meal a week of potatoes, or to keep meat off our table one day in a week. Those efforts will not look, as the old expression goes, “in it” with what you would do. It is one of the greatest things in the way of conservation. The possibilities are greater than anything else I have seen before the public.

It was said here this morning by a gentleman who, I suppose, is in the Government employ, and therefore had to be very careful and guarded in what he said, but it is not a secret, that that is the only flour that we can export to the United Kingdom. If you made a high patent, 40 per cent, to-day, you would have to get a license to send it to the Old Country. Is that not true?

Hon. Mr. CASGRAIN: Yes.

Mr. PRICE: They are only buying the 76 per cent. They do not prohibit buying anything of higher percentage extraction, but it must be at least 76 per cent. The Allied Governments are buying it through the Wheat Export Company at 76 per cent, and you yourself seem to be in line with the wisdom of the British Government, with the wisdom of the Allied Governments as shown by their buyers in New York. You are moving together, and I am satisfied that before the United States is through with it they will be in line. In fact, Mr. Hanna and Mr. Hoover will doubtless confer in the matter.

If there are any questions you would like to ask me, although I feel I did not have much to say, I should be only too pleased to answer them.

Hon. Mr. RICHARDSON: There would be no patriotism in this thing. The bread tastes as good.

Mr. PRICE: A little better to some of us.

Hon. Mr. RICHARDSON: We are not denying ourselves of anything.

Mr. PRICE: Except our sense of sight, and if you turn the gas down, it would not happen. I took flour and bread samples up to a meeting in the Public Library the other night, a packed meeting of ladies, and cut the different samples of bread and they could not distinguish them. The bread was baked by bakers. One sample was home made bread.

Hon. Mr. CASGRAIN: There are two samples, and you cannot tell the difference.

Prof. HARCOURT: Except for the colour.

Hon. Mr. DANIEL: You said flour only gives 42 per cent to the bushel?

Mr. PRICE: I corrected myself.

Hon. Mr. DANIEL: It gives 42 pounds to the bushel? That would be about 70 per cent?

Mr. PRICE: More nearly that.

Hon. Mr. RICHARDSON: You do not get 42 pounds of flour. You do not get over 39 pounds, do you?

Mr. PRICE: Well, I made some allowances. The average householder perhaps does not get more than thirty-eight, I would say, taking all the mills throughout the country. I would not want to say your mill does not make more than that, or a good part of it. Then there is the low grade taken out, and some of that is fed back in. It goes to make 110 per cent, if that is possible. But aside from that, there is a lot of it wasted as human food by being used for calf feed, pig feed, dog biscuit, and all that sort of thing; and that difference between what usually reaches the householder and what might reach him would be at least 10 per cent, or, as I said, the equivalent of 24,000,000 bushels of wheat.

Hon. Mr. CASGRAIN: There seems to be very little difference between the 80 per cent and the 76 per cent. We are down now to 4 per cent of difference. If the difference were split, if 78 per cent were made, that would go a great deal further, would it not?

Mr. PRICE: The bread would be deteriorated very considerably.

Hon. Mr. CASGRAIN: By just the 2 per cent difference?

Mr. PRICE: Yes. In my experience a first-class mill, well equipped, can take that white part into the inner skin, and get 76 per cent. After that you have to add more wood to it, and the quality is deteriorated quite rapidly.

Hon. Mr. CASGRAIN: Just by the 2 per cent difference?

Mr. PRICE: That is my experience as a miller. I have made it 76 per cent.

Hon. Mr. CASGRAIN: You have heard that document that was read here this morning by Dr. F. T. Shutt, Dominion chemist, Department of Agriculture? According to those scientific gentlemen in England, the proportion was 80 per cent, and he himself recommended 80 per cent—although he was far from partial to what I said about it. Still, he recommended 80 per cent.

Mr. PRICE: May I refer to something I said a moment ago? It may be misleading to say 76 per cent extraction. I do not know what wheat they are using in England. If they are using a very thin skinned wheat, a thin bran, something like the Washington white wheat, they may get a pretty good colour, and possibly get out 80 per cent. But that would have to be defined as 76 per cent of a wheat that tests a certain weight. If wheat that tested 62 pounds to the bushel were taken for your standard it would not be, as I said before, the same as the product of wheat testing 50. So you would have to strike an average for the season, and establish a flour that shall be equal to 76 per cent extraction of the average wheat of the season. Then there would not be any excuse for shipping our low-grade wheat at a sacrifice out of the country, and we would utilize that at home. I do not think anybody would suffer.

Hon. Mr. RICHARDSON: Could you not standardize the flour and have it come up to the sample and do away with all the other parts?

Mr. PRICE: Surely. There is one objection that may be made—in fact, one man in my own firm raised it. He said, "We have advertised certain grades of flour, the benefit of which we would lose." We should be willing to make the same sacrifices as our sons are making." Ogilvies will make 76 per cent under the same brand; the Lake of the Woods Milling Company will do the same, and others as well, and the competition will be between these mills which are making the best 76 per cent flour, but the Government steps in and says, "You must make it 76 per cent."

Professor HARCOURT: In the old country was it not based on what they call the Glasgow standard? They set a standard, and the flour had to be milled to that standard. The miller could not go over a certain colour.

Mr. PRICE: That is what I am getting at.

Professor HARCOURT: It might be difficult to make out whether a man did actually make a 76 per cent extraction, but he could not have a higher colour, then he could have his patent back of that. The money he will get will limit him to what he will put in it.

Mr. PRICE: That is what I meant. Now, with reference to additions being made to wheat flour in the form of different cereals. Thirty-three years ago I was running a corn flour mill in the United States, in conjunction with a large flour mill, and we took 3 or 4 rejected wheat, run it straight, and added 10 per cent of corn flour, and it was sold to one of the public institutions in Ontario, and when I came back I came into competition with it.

Professor HARCOURT: That would not be allowed to-day.

Mr. PRICE: No. Now in summing up, permit me to say, the only apparently valid objection to the use of a longer extraction would be the plea put forward that you are robbing the domestic animals of a part of their food supply, in reply to which I would say, there are many substitutes that stock can digest that man cannot and these substitutes can be produced at relatively short notice, spring grains, roots, etc., whereas it takes more than a year to produce wheat. I do not think our Canadian people are educated to the use of barley, corn, rye, etc., to any large extent as a cereal food. It would therefore appear to be the part of wisdom to adopt some such measure as is outlined in this bill and provide us with a food which would not be offensive, that has proven nutritious and would be more easily and readily adopted than making a radical change by the admixture of a proportion of other cereals.

G. W. SHOULDIS, Manager, Slinn-Shouldis, Limited, was called as a witness, and testified as follows:—

Mr. SHOULDIS: Gentlemen, I am not qualified as a miller. I am a practical baker. The sample which you have here is the first lot of 76 per cent flour that I have ever seen, although we have used it. The working of it is similar to that of the other flours, although it is a little faster, which would probably make a little change necessary in the mode of handling, but that is a small matter. As far as my knowledge goes I would say that it would make as much bread.

Hon. Mr. DANIEL: You are a baker?

Mr. SHOULDIS: Yes, I manufactured the sample loaves you have.

Hon. Mr. CASGRAIN: How do you know that this is 76 per cent flour?

Mr. SHOULDIS: I had to take the miller's word for it. It came from the Quaker Mills.

Mr. DWYER: We got five bags shipped in same as used by the British Government.

Hon. Mr. DANIEL: The bread is very nice.

Mr. SHOULDIS: There are other ingredients in it.

Hon. Mr. DANIEL: Did you make the 85?

Mr. SHOULDIS: No, that is a boughen loaf. That would be what we call Graham bread, but I do not know anything about 85 per cent flour. We get a whole wheat flour, but there is nothing to show that it is an 85 per cent flour or anything else.

Hon. Mr. DANIEL: What flour do you use most?

Mr. SHOULDIS: At the present time we use Western Canada flour, that white flour.

Hon. Mr. CASGRAIN: Purity flour.

Mr. SHOULDIS: Yes, Purity flour. It is something in the neighbourhood of 60 per cent, I think.

The CHAIRMAN: Will 100 pounds of 70 per cent flour make more loaves of bread than 100 pounds of 76 per cent flour?

Mr. SHOULDIS: No. The 76 per cent flour will take equally as much water as Purity flour, but I will not say that it takes any more.

Prof. HARCOURT: As a rule you will find that it will take more.

Mr. SHOULDIS: The effect of that is that there is more water in 400 grammes of flour, there are 240 cubic centimetres of water in the 76 per cent flour, and only 230 centimetres in the other.

Hon. Mr. CASGRAIN: Purity flour will take more water?

Mr. SHOULDIS: No, the 76 per cent will take more water.

Hon. Mr. CASGRAIN: It will make more bread.

Mr. SHOULDIS: Yes.

Hon. Mr. DANIEL: You get more weight?

The CHAIRMAN: I should have thought the finer the flour the more water it would take. I understood that the reason the bakers liked flour from No. 1 Manitoba hard, was that they got more bread per barrel of flour.

Mr. SHOULDIS: We will get more bread out of a strong baker or a second patent than we will out of a first patent. Brown bread, as we call it, is an article that is very little used. In our factory, we make possibly only four or five hundred loaves a day. We are only too pleased to give it to any one that wants it. As far as the keeping qualities of the bread are concerned, the brown bread will keep even better than the white, but as Mr. Banks has said, there is some waste; there are only a certain number of people who use it, and if they do not take it they certainly do not want it the next day when it is a day old.

Mr. BANKS: I quoted percentage returns.

Hon. Mr. DANIEL: Have you formed any opinion as to the comparative economical value of Purity flour and 76 per cent flour? Would you say that people who wanted to be economical could get more value out of bread made from 76 per cent flour or that made of from Purity flour?

Mr. SHOULDIS: You mean both costing the same? We have no means of knowing what the 76 per cent flour will cost.

Hon. Mr. DANIEL: Mr. Labelle said that it would be about 24 cents a barrel cheaper.

Mr. SHOULDIS: Well, if you are going to make 174 pound-and-half loaves, and divide the 24 cents a barrel among them, it will make a very slight reduction.

Hon. Mr. DANIEL: Do you know anything about the food value of it?

Mr. SHOULDIS: No, I do not.

Hon. Mr. CASGRAIN: How many pounds do you get from 196 pounds of flour?

Mr. SHOULDIS: We average around 174 pound-and-a-half loaves.

Professor HARCOURT: Two hundred and sixty-one pounds.

The CHAIRMAN: I am given to understand that there is a difference of 50 cents a barrel.

Hon. Mr. CASGRAIN: It is said that 281 pounds can be made out of 196 pounds of flour.

Mr. SHOULDIS: We never get that.

Hon. Mr. CASGRAIN: Did you never hear of it being done?

Mr. SHOULDIS: I have heard that certain bakers under certain conditions claimed that they had a shrinkage of only two ounces to the pound-and-a-half—to the 24 ounces. In our factory we have to allow for a shrinkage of $3\frac{1}{2}$ to 4 ounces in 24, in order to hold the weight in supplying the public.

Hon. Mr. DANIEL: Do you weigh the dough?

Mr. SHOULDIS: Yes.

Hon. Mr. DANIEL: And you have to put in $3\frac{1}{2}$ ounces more than is realized after it is baked?

Mr. SHOULDIS: Yes.

Mr. BANKS: That is where quite a lot of difference occurs in the method of estimating. It is common practice among the bakers to weigh and figure on the weight of dough, while quite a large number of estimates, particularly laboratory

estimates by colleges and research departments, are figured on the dry weight of the bread and a different age of maturity.

Mr. SHOULDIS: We figure on the weight of the bread.

Hon. Mr. CASGRAIN: After 16 or 18 hours?

Mr. SHOULDIS: After six hours. It is going out to the public in about seven or eight hours. We figure on about eight hours. The sample before you scaled 28 ounces for the pound-and-a-half.

Professor HARCOURT: Of dough?

Mr. SHOULDIS: Yes.

Hon. Mr. DANIEL: There would be an evaporation of four ounces of water.

Mr. SHOULDIS: Yes. Something was said about corn flour. The Americans have used corn flour for years, dry corn flour, 8 pounds of which will absorb a gallon of water. They mix that in with their dough, but the baker forgets that after he gets that into his dough and it is weighed out as dough, that he is getting more dough to the barrel than he would without it. It evaporates more in his oven, and he has to allow more for shrinkage or his bread is going to be light weight when it goes to the public.

The CHAIRMAN: If a law was passed that you had to use 76 per cent flour, would it make any difference to your business, financially or otherwise?

Mr. SHOULDIS: In my judgment it would not.

Mr. PRICE: It is like the Golden Rule, you could not work it alone, the other baker would have to do it.

Mr. SHOULDIS: Yes, we certainly could not use 76 per cent if our competitors were using 60 per cent, as they are doing now.

Hon. Mr. CASGRAIN: Is the Western Canada flour that you use only 60 per cent?

Mr. SHOULDIS: Oh no.

Hon. Mr. CASGRAIN: What is it?

Mr. SHOULDIS: I could not tell you. Some of them claim that it is around 60.

Professor HARCOURT: Purity is a patent flour, about 35 or 40 per cent.

Mr. SHOULDIS: I just heard that remark.

W. H. DWYER, Grain Exporter, Ottawa, was called as a witness and testified as follows:

Mr. DWYER: Gentlemen, I do not know that I have anything to add to what has already been said. I have no advice to give but I am perfectly willing to give any information that I can. I am President of the Slinn-Shouldis Company, but from the technical side I think Mr. Shouldis has told you all he can.

Hon. Mr. DANIEL: You are a grain exporter?

Mr. DWYER: No.

Hon. Mr. DANIEL: On the list of witnesses you appear as a grain exporter.

Mr. DWYER: Before the war.

The CHAIRMAN: Do you think it would interfere in any way with the business of the grain dealers?

Mr. DWYER: No. I cannot see how it would, and even if it did, I think there is a larger question—how are we going to feed the people? I have been a strong advocate of the use of this flour. We had a meeting of the Board of Trade in Ottawa some time ago. The farmers came to us to see what we could do to help them get crops in, and this question arose during the discussion. I suggested that if we were 250,000,000 bushels short in the wheat crop we had better get busy, but as time goes on things seem to be getting worse instead of better. Around Ottawa there has been considerable

talk, but not very much action. I was very glad to read Senator Casgrain's speech. I saw a report from Washington in which it was stated that the American crop would increase about 35,000,000 bushels. I have a report from the Grain Exchange in Winnipeg which I will read to you. It says: "Saskatchewan Government Crop Report, just issued to-day as follows: All crops reported from one to two weeks later than last year. In the Southwestern parts of province almost total failure is expected, in other parts crops will be light, unless we have exceptionally weather. The straw will be short. 90 per cent of the summer fallow completed. Average hay crop expected. W. R. Bawlf." This indicates that things are worse than we anticipated.

Hon. Mr. RICHARDSON: A good deal worse. I think that report was probably made some days ago and has just come out. We have been getting good weather lately. Short straw does not hurt anything if there is a good head.

Mr. DWYER: I am not discouraged, but it behoves us to be careful, and I do not know anyway of doing it except to use more of the wheat berry, which will not hurt anyone.

Prof. HARCOURT: We shall never know the difference.

Mr. DWYER: I lived on worse bread than that until I was thirty years of age.

Hon. Mr. CASGRAIN: You are pretty husky.

Mr. DWYER: Yes. I hope that conditions are not as bad as they are pictured. I showed this telegram to Senator Richardson, and he suggested that I should read it.

Hon. Mr. RICHARDSON: I thought it would help us in forming an opinion—putting up a hedge to protect ourselves.

Mr. DWYER: I think we need some hedge now.

The committee adjourned.



